TAWA

KING

RF GENERATOR

TEST ENG.

KTR ~~9005~~ 905

AUDIO GENERATOR

The Audio Generator boards frequency and output level are selected by the Audio Select switch. This board contains a regulated power supply, variable frequency oscillator, and a variable gain amplifier. When one of the push button switch is closed, 2 variable resistors are selected and connected to the oscillator and the amplifier. Each level and each frequency have their own variable resistor so that interaction between adjustments is greatly reduced. All connections to this board are thru an I.C. socket used as a connector.

BCD CODE SWITCH

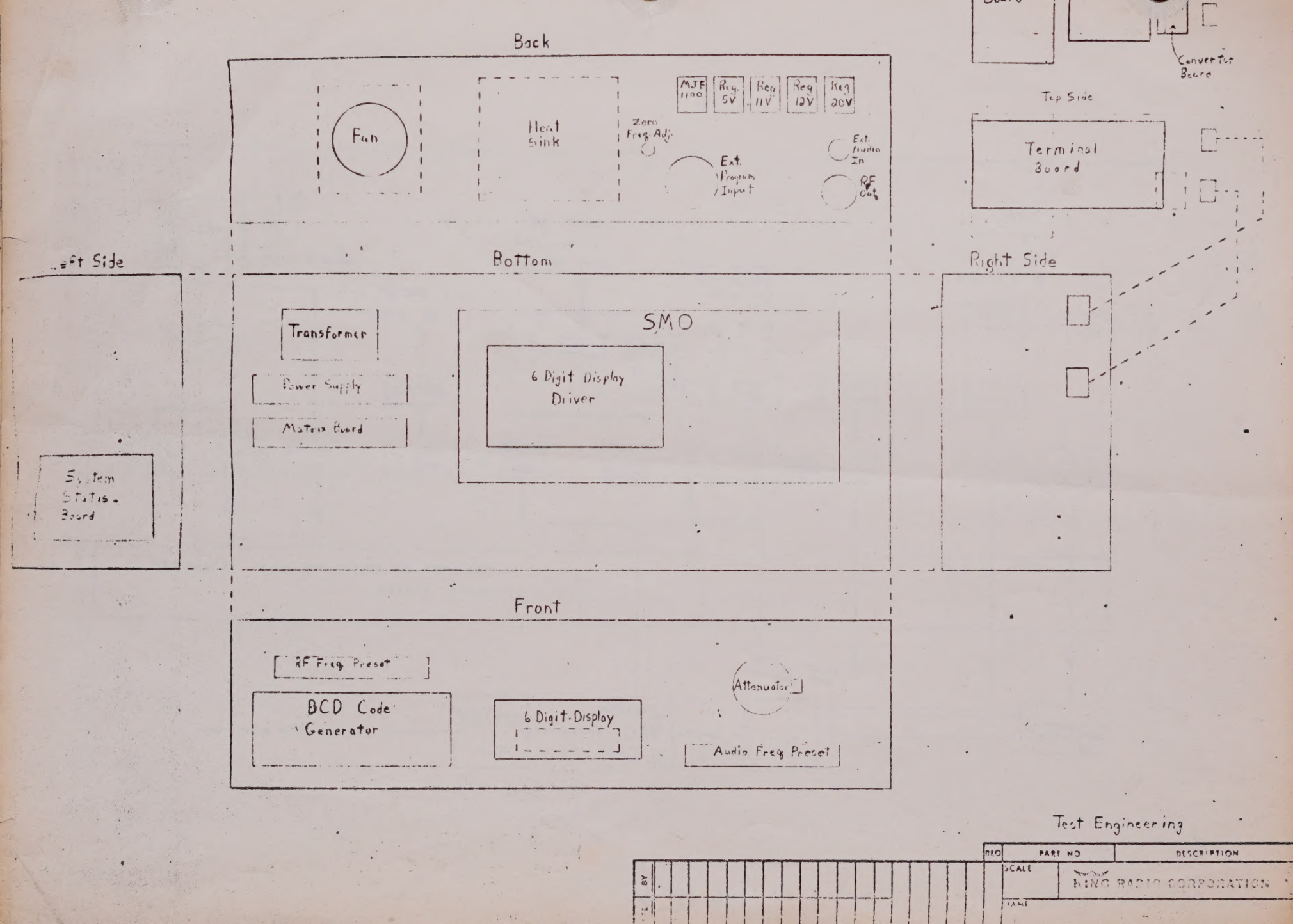
This board contains 4 - S.p. 10T. switches, pull down resistors, and a diode matrix. The matrix converts 1 line of 10 to BCD information and is available on the output connector with L.S.B. "A" on pin 1. Ground and +11 volts are hard wired to the board.

PRESET MATRIX

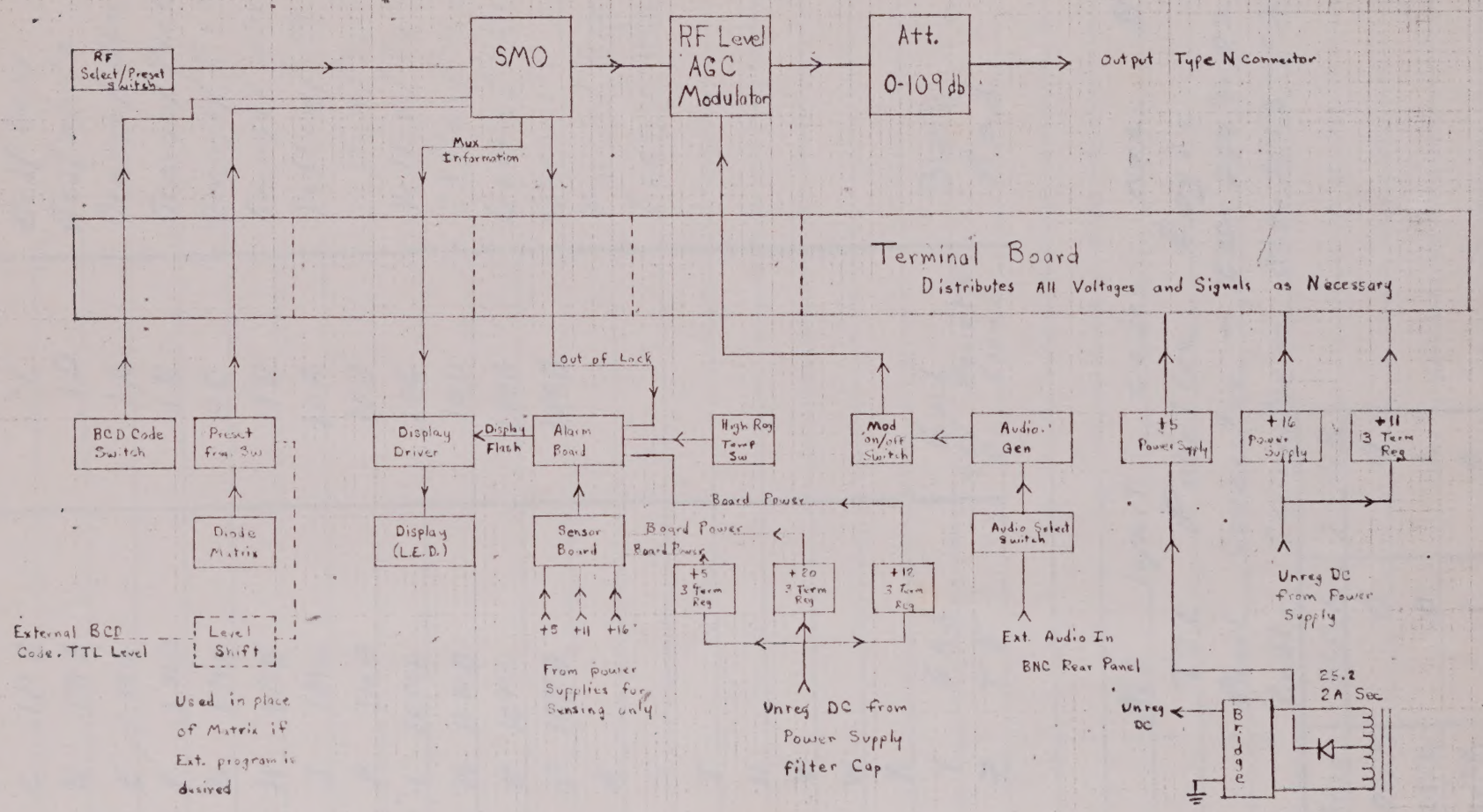
This is a plug in card composed of 23 lines of diodes. An external switch selects which line of diodes is in the circuit, with the output lines carrying a BCD code. This set of codes and the BCD code switch output are always available to the Data multiplexer which selects the type of data needed. Codes for the BCD switch and preset matrix are the same for a given frequency.

SENSOR BOARD

This board contains 8 independent sensing circuits, 4 high sense and 4 low sense. By using a circuit jumper, a high and a low sense can have their inputs connected together to form a window circuit. This board uses 3 window circuits, inputs #1, #2, and #3. Circuit #1 senses +5 volts high and low, #2 senses +11 volts high and low, and #3 senses +16 high and low. Each sensing circuit has an adjustable limit and an input voltage divider for greater than power supply voltages. Each circuit has a PNP output transistor for driving indicators and the board contains 2 - 3 terminal regulators (+5 volts and +20 volts). All inputs and outputs are hard wired.


Back
Fan
Heat Sink
MJE 1100
Reg 5V
Reg 11V
Reg 12V
Reg 20V
Zero Freq Adj
Ext. Program Input
Ext. Audio In
RF Out
Converter Board
Top Side
Terminal Board
Left Side
System Status Board
Bottom
Transformer
Power Supply
Matrix Board
SMO
6 Digit Display Driver
Right Side
Front
RF Freq Preset
BCD Code Generator
6 Digit Display
Attenuator
Audio Freq Preset
Test Engineering
REQ
PART NO
DESCRIPTION
SCALE
NAME
BY
RING RADIO CORPORATION

R.F. GEN.


RF Select/Preset Switch
SMO
RF Level AGC Modulator
Att. 0-109db
Output Type N Connector
Mux Information
Terminal Board
Distributes All Voltages and Signals as Necessary
Out of Lock
BCD Code Switch
Preset from Sw
Display Driver
Display Flash
Alarm Board
High Reg Temp Sw
Mod on/off Switch
Audio Gen
+5 Power Supply
+16 Power Supply
+11 3 Term Reg
Diode Matrix
Display (L.E.D.)
Sensor Board
Board Power
Board Power
Board Power
+5 3 Term Reg
+20 3 Term Reg
+12 3 Term Reg
Audio Select Switch
Unreg DC from Power Supply
External BCD Code, TTL Level
Level Shift
+5 +11 +16
From power Supplies for Sensing only
Ext. Audio In BNC Rear Panel
Unreg DC from Power Supply filter Cap
Unreg DC
Bridge
25.2 2A Sec
Used in place of Matrix if Ext. program is desired

Pins	RF Gen.	479-T	Wire
A	25KcA	.1A	Red/Blue
B	25KcB	.1B	Red/Violet
C	.1MA	.1C	Red/Gray
D	.1MB	.1D	Red/white
E	.1MC	1A	Orange/Blue
F	.1MD	1B	Orange/Violet
G	1MA	1C	Orange/Gray
H	1MB	1D	Orange/white
J	1MC	10A	Yellow/Blue
K	1MD	10B	Yellow/Violet
L	10MA	10C	Yellow/Gray
M	10MB	10D	Yellow/white
N	10MC	100A	Green/Blue
P	10MD	100B	Green/Violet
R			Green/Gray
S			Green/white
T			
U			
V			
W			
X			
Y	Gnd	Gnd	Black
Z	+5	+5v Remote 0v Local	Red

All input codes are BCD
TTL Positive Logic
Panel Connector — 030-2064-02
Cable Connector — 030-2063-02

Freq	25KcA	25KcB
00KHz	0	0
25KHz	0	1
50KHz	1	0
75KHz	1	1

4.3 KTR 905 DETAILED CIRCUIT THEORY

4.3.1 FREQUENCY SYNTHESIZER

4.3.1.1 GENERAL

The digital frequency synthesizer is the heart of the KTR905. It supplies both transmitter oscillator signal and receiver local oscillator signal. Since the receiver uses high-side injection with a 10.0MHz, I.F, the total frequency coverage of the synthesizer is 118.000 through 145.975MHz in 25KHz spaced channels. Frequency stability is achieved with a single stable reference oscillator which is crystal controlled at 3.20000MHz. The design is essentially a phase-locked loop using a pulse swallowing technique.

The block diagram theory of operation has already been presented in Section 4.2.1. Since the synthesizer is a feedback system with every section interacting with every other section, one should follow the block diagram theory at the same time they are reading the detailed theory of each block.

The internal frequency standard for the synthesizer is 25KHz. The reference, stable frequency source, is a 25KHz square wave derived from a 3.2MHz reference oscillator.

4.3.1.2 REFERENCE OSCILLATOR

Transistor Q218 is the active device used in a colpitts oscillator circuit. Feedback is provided between base and emitter with C240 and C241. The 3.2MHz crystal, Y201, provides the inductive reactance of a series resonant circuit with C242 and C243. The 22pfd capacitor, C242, is temperature compensated and works in conjunction with the temperature coefficient of the crystal to provide optimum tracking. The resistors R258, R259, and R260 bias the transistor and L207 is the collector load with CR213 providing the reverse current path.

Transistor Q219 is a Class A saturating buffer amplifier producing a square wave output at approximately 5 volt amplitude to be compatible with the TTL logic.

4.3.1.3 REFERENCE DIVIDER

Integrated circuits I223 and I224 are both divide-by-16 counters. Essentially these IC's contain four flip-flops in cascade so that the output switches only 1/16 as often as the input. The divide-by-16 output of I223 is connected to the input of I224. The output of I224 is taken from the third flip-flop so that the IC is being used as a divide-by-8. Therefore the total division is 128 and the output is a stable 25KHz square wave.

4.3.1.4 PHASE/FREQUENCY COMPARATOR

The phase/frequency comparator is the frequency summing junction in the synthesizer feedback system. The error signal is the output of the comparator. It is this error signal which drives the VCO to the precise frequency of oscillation.

Figure 4-4 shows the phase/frequency comparator circuit and Table 4-3 will be used to demonstrate its operation.

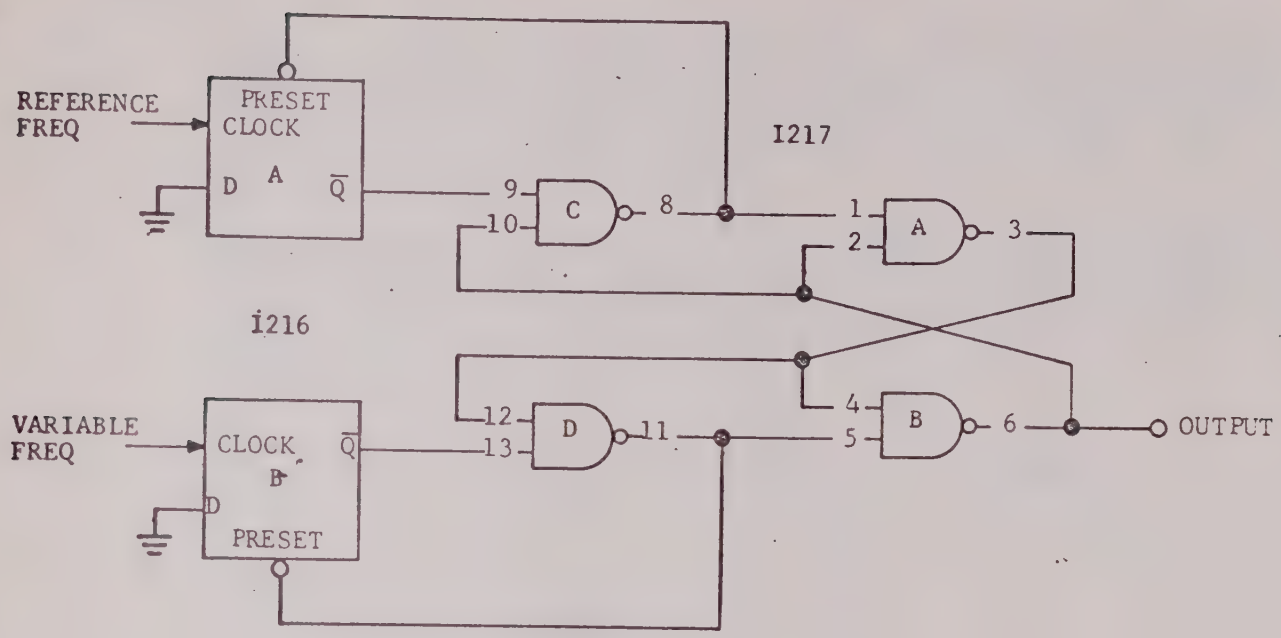


FIGURE 4-4 PHASE/FREQUENCY COMPARATOR CIRCUIT

Integrated circuit, I217, is connected in an R-S flip-flop configuration. Considering it separately, the operation is such that it follows this truth table written in terms of IC pin numbers.

INPUTS		OUTPUTS		
Pin #9	Pin #13	Pin #8	Pin #11	Pin #6
Low	Low	Hi	Hi	Remains in previous state
Low	High	Hi	Hi	High
High	Low	Hi	Hi	Low
High	High	Hi	Lo (1)	Remains in previous state
		Lo	Hi (2)	

(1) condition when previous state was low
(2) condition when previous state was hi

TABLE 4-3

Ahead of the R-S flip-flop are two D-type flip-flops (I216). The D inputs are grounded so that without preset inputs a reset state ($Q=0$, $\bar{Q}=1$) is clocked into the flip-flop on each clock pulse. However, since a feedback path is provided from the R-S flip-flop the D-type flip-flops will be placed in a set state whenever the appropriate preset input goes low.

Consider the circuit of Figure 4-4 at turn-on time. Supposing that both D flip-flops are in the reset state ($Q=0$, $\overline{Q}=1$), the circuit will be forced to a different state since both pin #8 and pin #11 of I217 will switch "low" causing the D flip-flops to reset. The end result is that only two possible states, either "low", "high" or "high", "low" for pin #3 and pin #6 of I217 respectively can exist.

Assuming that the circuit comes to rest in the condition for pin #6 "low", consider a positive transition to occur on the clock input to I216B. The $\overline{Q}_B$ output will then switch "high" causing the R-S flip-flop (I217) to change state (pin #6 will go "high"). Only a positive transition on the clock input of I216A can cause a return to the original state. Therefore the truth table for this circuit is:

I216		I217			
$Clock_A$	$Clock_B$	Pin #3		Pin #6	
		t_n	t_{n+1}	t_n	t_{n+1}
Pos.trans.	-----	0	1	1	0
-------	Pos. trans.	1	0	0	1

TABLE 4-4

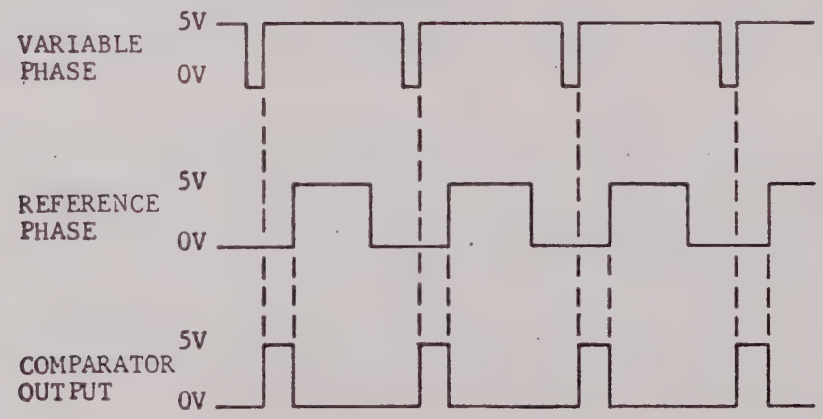


FIGURE 4-5 REFERENCE AND VARIABLE PHASE WAVEFORMS

The input waveforms (see Figure 4-5) are the reference and variable phases. The reference phase signal is a 25KHz square wave taken directly from the output of the reference divider, I224. The variable phase signal is a pulse whose width is equal to four cycles of the synthesizer's output frequency, and when the synthesizer is locked-up the period of the variable phase signal is 40μsec. (The same as the 25KHz reference) The variable phase signal comes from the output of the programmed counter.

The synthesizer is "locked-up" only when the variable phase signal is at exactly the same frequency as the reference phase signal. The feedback loop forces the phase between the two signals to change as the synthesizer's channeled frequency is adjusted. At the low frequency end of the band (118.000MHz) the phase difference is such that the comparator output is of the shape given in Figure 4-5.

At the high end of the synthesizer band (145.975MHz), the phase difference is such that the comparator output looks like Figure 4-6.

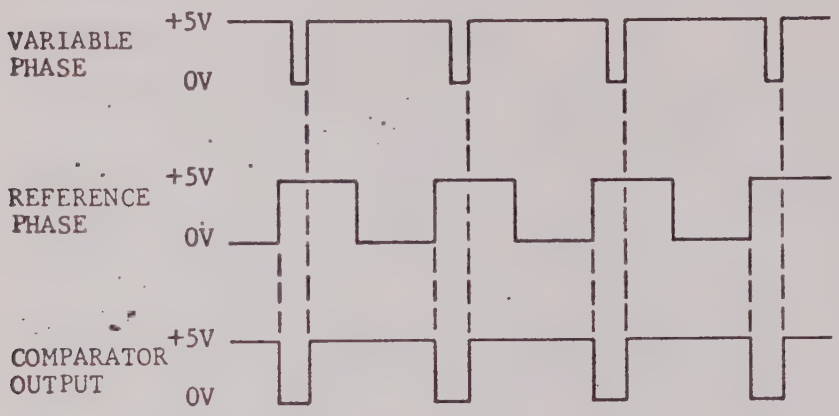


FIGURE 4-6 COMPARATOR OUTPUT PHASE DIFFERENCE

The comparator output is inverted by the filter driver and once it passes through the loop filter becomes a D.C. voltage. The levels are such that this tuning voltage ranges from 2.45VDC at the low end of the band (118.000MHz) to 13.75VDC at the high end of the synthesizer's band (145.975MHz). It should be noted that not only does the tuning voltage control the VCO frequency, it also tunes the receiver preselector to provide tracking across the band.

The SMO's phase-locked loop acts in such a fashion as to seek out the correct VCO frequency and lock on it. This is accomplished with the output characteristics of the phase/frequency comparator. Consider at turn-on time a VCO which is operating at a frequency below its correct value. The period of the variable phase signal will therefore be greater than 40μsec. The operation of the circuit can be understood with reference to Figure 4-7. The instant that a second positive transition on the reference phase (before a variable phase pulse) is detected, the comparator latches. The latching action is caused by the $\overline{Q}_A$ output switching and remaining "high". The net result is that two cycles of frequency coherence are required before it returns to normal operation.

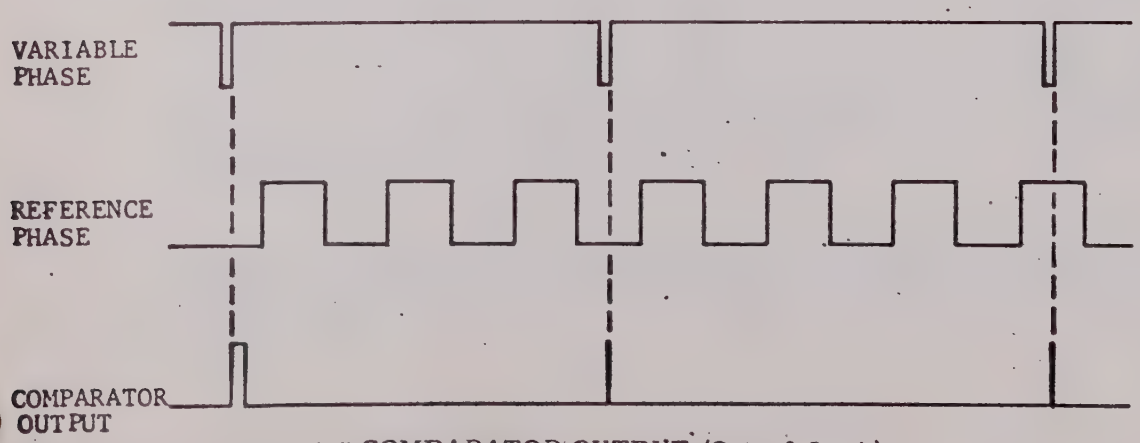


FIGURE 4-7 COMPARATOR OUTPUT (Out-of-Lock)

As Figure 4-7 indicates, a low VCO frequency will cause the output of the filter driver and filter to go to a high voltage. This will drive the VCO up in frequency until frequency coherence is achieved. The operation is analogous for a high VCO frequency. In that case, the filter output goes low driving the VCO down in frequency.

4.3.1.5 LOOP FILTER AND FILTER DRIVER

The loop filter is a critical part of the digital frequency synthesizer. It is necessary to provide a filtered D. C. voltage for the tuning voltage which adjusts the VCO frequency. The filter is a sophisticated low pass design with an attenuation notch occurring at 25KHz. This notch attenuates any 25KHz signal by over 100db. Since the phase/frequency comparator output consists of a D. C. level which is the average value of the waveform, 25KHz and harmonics of 25KHz; the output of the loop filter is a D. C. voltage proportional to the average value of the comparator output. Any residual 25KHz or its harmonics produce sidebands on the synthesizer output signal. These sidebands, if severe enough, can cause "close in" receiver spurious responses and transmitter spurious outputs. The filter is designed at a 1KΩ impedance level. Resistor R208 and capacitor C206 provide a slight phase compensation for the overall phase-locked loop to optimize lock-up time (the time required for the synthesizer to stabilize on a new frequency) and provide loop stability.

The filter driver circuit is a buffer between the phase/frequency comparator and the loop filter. Its purpose is to provide the proper source impedance (1KΩ) to drive the loop filter. Transistor Q208 acts as a shunt switch driven from the digital comparator signal. Resistor R204 determines the base current when the comparator signal is "high" and resistor R205 eliminates reverse leakage effects when the comparator signal is "low".

The resistor R206 and diode CR208 provide the 1KΩ impedance path to a "high" level when Q208 is turned "off" and resistor R207 provides the 1KΩ impedance to a "low" level when Q208 is turned "on".

The inductor L208 and capacitors C201, C203, and C257 provide 16 volt line decoupling.

4.3.1.6 VCO

The voltage controlled oscillator (VCO) is the locked oscillator which generates the actual synthesizer output frequency. It is a colpitts design using transistor Q209. Emitter-to-base feedback is provided with C210 and C211. The resonant circuit is formed mainly from the parallel resonant circuit of capacitor C260, varactor CR209, and inductor L204. Capacitor C247 couples the resonant circuit (which is tapped on the coil for impedance matching) to the transistor. Resistors R211 and R212 set the base bias with resistor R214 setting the operating current. The output is taken from the R251 collector load. Resistor R291 and capacitors C209, C212, C280 and C282 are necessary decoupling components.

The VCO frequency is directly a function of the voltage appearing at the common cathode junction of the back-to-back varactor, CR209. Since both diodes are in reverse bias operation, the D. C. current is almost negligible and R210 is used to block the rf appearing on the diode.

The VCO output is used to drive the receiver and transmitter buffers which will be described later. It also drives the digital buffers that isolate the VCO from the Prescaler.

4.3.1.7 DIGITAL BUFFERS

The digital buffers are high gain Class A amplifiers which are used to amplify, isolate, and provide the necessary voltage level shift to drive the Pre-scaler. The buffers are a straight forward design using two base bias resistors and a collector and bypassed emitter resistor to set the operating point. The 100 ohm resistors and .001μfd capacitors are necessary for 16 volt line decoupling. Resistors R250 and R251 shift the output level to that necessary to drive the ECL (emitter-coupled logic) prescaler (I214). The ECL levels are set for a "low" of 3.3 volts and a "high" of 4.1 volts. Resistors R250 and R251 provide a quiescent bias of 3.7 volts for the input of I214.

4.3.1.8 PRE-SCALER

Integrated circuits I214, I215 and transistor Q217 form the circuitry for the first frequency divider. The integrated circuit is a high frequency ECL divider. It is programmable to divide its input frequency by either 10 or 11. Pins #2 and #3 control the divide ratio. The I. C. will divide by 10 for all combinations of inputs on those lines, except for the condition where both lines are "low". In this mode, the I. C. gives a divide by 11.

The transistor Q217 acts as a buffer between the ECL prescaler and the TTL dual flip-flop, I215. The Q and $\overline{Q}$ outputs are used to provide positive and fast switching of Q217. The diode CR211 is necessary to give the extra standoff voltage drop between the Q and $\overline{Q}$ levels, which by themselves swing from a "low" of 3.3 volts to a "high" of 4.1 volts giving a voltage difference of only .8 volts. Resistor R252 is a necessary load resistor for the ECL prescaler, I214. The output from Q217 is taken off the collector with collector load resistor R253. In the "high" state the output voltage will be the 4.1 volts existing on the emitter less approximately .3 volts, the saturation voltage of Q217. This "high" level is a more than satisfactory "high" input level for TTL logic. A "low" state exists when Q217 is turned off and its collector drops to ground potential. Diode CR212 is used to keep the transistor from saturating, a condition which would lower the switching speed of the circuit.

Integrated circuit I215 is a dual J-K flip-flop which acts as a divide-by-4 frequency divider. The output of the "B" flip-flop (pin #9) is used to drive the swallow and program counters. When the control lines to I214 are in the divide-by-10 condition, the output is a square wave whose frequency is 1/40th of the VCO frequency. The "$\overline{Q}$" output (pin #8) of the B section and the "Q" output (pin #5) of the A section are inputs to a NAND gate which is used to enable the divide-by-11 function of I214, only during the state where Q_A= "hi" and Q_B= "lo". Resistors R254 and R256 provide the necessary TTL to ECL interface. It should be noted that I214 will not divide-by-11 each time that the mentioned condition of I215 exists; rather it is necessary for a terminal count condition from the swallow counters to also exist. The purpose of this is to allow three output counts from I214 for the swallow counter output to stabilize before a divide-by-11 is enabled - a necessity due to the high frequencies involved.

4.3.1.9 PROGRAM COUNTER

The Program Counter consists of I221 and I222. It is used to program the 1 and 10 megahertz lines. Integrated Circuit I221 is a 10 count BCD counter and I222 is a 16 count BCD counter. Although there are BCD parallel outputs, they are not used. Instead the Terminal Count output (pin #15) is used. Each I. C. consists of four flip-flops. I221 is internally connected such that when the four flip-flops reach the "1001" (9) state, a terminal count ("high" on pin #15) whose width is equal to the clock period occurs. Similarly I222 operates to produce a terminal count when the flip-flops reach the "1111" (15) state. The inputs on pins 3, 4, 5 and 6 are used to program the I. C. s to a particular starting point. The programming is done in BCD in such a fashion that the BCD number with pin #3 being the last significant digit and pin #6 being the most significant digit sets the initial state of the counter. Therefore if a "0011" (low-low-high-high) input is given on the four lines (pins #6, 5, 4, and 3 respectively), the counter can be preset to the 3 state. It will then take 6 clock pulses for I221 to reach terminal count or 12 clock pulses for I222 to reach terminal count. The counters will be preset whenever pin #9 ($\overline{PE}$) is permitted to go low and a clock pulse occurs. If no preset occurs when the counter reaches its terminal count, the I. C. will go to the "0" state on the next clock pulse and continue counting from there.

The operation of the program counter can best be shown through the illustration of an example. The synthesizer frequency of 126.000MHz will be considered for illustration.

In order to program this channel, the loop must act to force the VCO to exactly 126.000 MHz. The program counters are set up to program the megahertz channel values only.

For the loop to "lock-up", the variable phase input to the phase/frequency comparator must be a 25KHz signal. Therefore the counters must be arranged in such a fashion as to provide an output pulse once every 40μsec ($\frac{1}{25,000}$ sec) when the VCO frequency is 126.000MHz. Since this is a whole megacycle channel, the swallow counters will be programmed such that pin #2 of I214 will remain "high" causing I214 to divide by 10 during the entire counting sequence. Integrated circuit I215 gives an additional divide by 4.

The result is a divide of 40 which acts as the clock input signal to I. C. s I219 through I222. It is connected through R292 to suppress any ringing on the waveform. The program counter therefore must divide its clock frequency by 126 in order to supply the 25KHz variable phase signal. The division is performed by the program counters which are programmed to give a terminal count once for every 126 clock pulses.

The program counting sequence is done by presetting I221 to the 9's complement of the 1MHz information. (The 9's complement is the number which equals the information number subtracted from 9). Therefore I221 is preset to 3 (9-6). After 6 clock pulses, I221 will give a terminal count which enables the clock pulse on I222.

Integrated circuit I222 has been preset to the 15's complement of the 100MHz and 10MHz information. (The 15's complement being analogous to 9's complement only subtracting from 15 instead). Therefore for this channel, I222 is preset to 3 (15-12). Consequently its clock pulse must be enabled 12 times for a terminal count to be produced from I222.

The program counter will then operate as follows:

After 6 clock pulses, I221 will clock to its zero state and I222 will be enabled to move to its 4 state. Integrated circuit I221 will then cycle to give another terminal count after 10 clock pulses enabling I222 to shift to its 5 state. This process will continue until both I221 and I222 reach their terminal counts simultaneously. This will occur at exactly 126 clock pulses later. At that time only, pins #4 and #5 of I218 will be in the "high" state causing pin #6 to go to a "low" state. That transition represents the output pulse (variable phase signal) and is also used to enable I. C. s I219 through I222 to be preset to their original preset (programmed) values. One counting sequence is therefore terminated and the entire sequence starts over on the next clock pulse.

4.3.1.10 SWALLOW COUNTER

The above example was worked out for 126.000MHz. In order to program fractional MHz channels, the swallow counter is employed. A different frequency, 126.025MHz will be used to demonstrate the operation of the swallow counter.

Integrated circuits I219 and I220 are both divide-by-10 counters and are identical to I221 as described previously. These are preset in a 99's complement form if the KHz channels are thought of as 40 numbered channels with .000MHz as number "0" and .975MHz as number "39". For example, the frequency 126.025MHz would have a KHz channel number of "1". The 99's complement is then 98 (99-1). Therefore I220 will be preset to a value of 9 and I219 will be preset to a value of 8.

Before the first clock pulse arrives from I215, pin #3 of I218A is "high" since both I219 and I220 do not have terminal count outputs. This causes pin #11 of I218D to be "low" which enables I214 to divide-by-11 when I215 gets into the proper state as previously described. The divide-by-11 function results in I215's action being delayed in time by one cycle of the VCO frequency. Thus a VCO pulse is effectively "swallowed".

Once the first clock pulse arrives, I219 moves to its "9" state and both I219 and I220 produce terminal count outputs which inhibit any further pulse "swallowing" by I214. Integrated circuits I219 and I220 stay in their terminal count conditions while the program counter goes through its cycle. Only when the variable phase pulse occurs will the swallow counters be preset once again.

The single "swallowed" pulse has the effect of delaying the program count sequence by the time required for one VCO period. In order for the variable phase pulse to be at the same frequency as the reference phase, the VCO output will be forced to be 25KHz higher than the program counter alone generates. Consequently a frequency of 126.025MHz results.

The additional KHz frequencies are channeled by presetting the "swallow" counter to cause several VCO pulses to be "swallowed" during one complete count sequence. Each "swallowed" pulse adds 25KHz to the VCO frequency.

4.3.1.11 CHANNELING INFORMATION

The information necessary to program the four I. C's (I219- I222) is applied to their coding inputs (pins #3 through 6). The information is in the complement forms as described above with the actual value represented by the 4 bit BCD (binary coded decimal) equivalent. The inputs are designated A, B, C, and D with A representing the least

significant bit and D representing the most significant bit. Therefore if the number 5 were to be coded into a particular I. C., the A, B, C, D inputs would be "high , low, high, low" respectively. Since these are TTL counters the "low" is represented by 0.0 volts and the "high" is represented by 4.0 to 5.0 volts.

Table 4-2 shows all code inputs for the four I. C. 's at every possible channel. It should be noted that the synthesizer must be capable of coding 1120 channels in the range from 118.000 to 145.975MHz because the receiver uses a high-side injection 10.0MHz above received frequency.

The actual logic hardware that provides the code inputs is called the channeling logic and is described in section 4.3.2.

4.3.1.12 OUT-OF-LOCK DETECTOR

Resistors R264 and R265 provide a negative logic AND gate. When the synthesizer is "locked-up", pins #6 and 8 of I216 will be "low" simultaneously at the time an output is generated from the phase/frequency detector. The low voltage is used in conjunction with Q203 and the time constant formed with R266 and C246 to provide a "high" (nearly 16 volt) level for the base of Q204. Transistor Q204 is an emitter follower design and is used to supply power to the receiver and transmitter buffers. When the synthesizer is unlocked, pins #6 and 8 of I216 have fast "low" spikes which never coincide and therefore keep Q203 turned on forcing the base of Q204 low and turning the buffers off. Capacitor C250 is used for noise immunity.

Capacitor C249, resistor R267 and diode CR214 provide temporary shut-down of the buffers during the transition from receive to transmit to eliminate spurious radiation while the synthesizer stabilizes to the correct frequency. It is done by giving an artificial out-of-lock signal with a time constant determined by R267 and C249. When the $\overline{\text{PTT}}$ line goes "high" (transmit mode) C249 will charge through R267 and the base of Q203. Diode CR214 clamps the base of Q203 to save the transistor from reverse breakdown during switching from transmit to receive.

4.3.1.13 RX AND TX BUFFERS

The RX and TX Buffers are used for isolation and amplification of the VCO signal to make it useable for the receive and transmit drives respectively. The buffers are controlled by the RX Enable in such a fashion that only one buffer is operating at a time.

The buffers are straight-forward Class A amplifiers. Capacitive (100pfd) coupling is used throughout and each stage has a 100Ω and .001μfd for 16 volt line decoupling. The receive buffer uses 2 stages to generate 8mw (typ.) of rf output. The transmit buffer uses 3 stages to generate 12mw (typ.) of output. The third transmit buffer stage uses a choke as a collector load instead of a resistor to get the additional power gain.

Both buffers use a pi-network low pass coupling network to match the output buffer stage with the 50 ohm load presented by both transmitter and receiver inputs. It is a low pass design in order that harmonics can be attenuated.

Transistors Q205, Q206, and Q207 are used to switch the appropriate buffer on at the proper time. This function is controlled by the RX Enable line which is "low" (grounded) for receive mode and "high" (open) for transmit.

The buffers are supplied with 16 volts from the "out-of-lock" detector transistor, Q204. In receive mode transistors Q205 and Q206 are biased "on" to saturation through the bias supplied through R225. Transistor Q205 will then switch the receive buffer into its "on" state. With Q206 also saturated, the common connection between R231 and R232 is pulled to 16 volts which turns Q207 "off" turning the transmit buffer "off". Diode CR210 is used to ensure positive turn-off.

The transmit mode causes both Q205 and Q206 to be turned "off" by resistor R226 which holds each base to 16 volts. As a result the receive buffer is turned "off" and the transmit buffer is turned "on" by virtue of Q207 being turned "on" through the bias of R231 and R232.

4.3.2 CHANNELING LOGIC

4.3.2.1 MODE SELECTION

Mode selection is accomplished by I201, 202, 203 and Q220. Parallel BCD frequency information from an external control head such as the KFS 590B comes in as a pattern of grounds and opens on the frequency select wires. Diodes CR219 through CR230 provide isolation from external high voltages that may be present on the channeling lines and R279 through R290 are pull-up resistors for the lines which are not grounded. C266 through C277 are RF bypassing capacitors. These channeling lines form one set of inputs to I201, 202, and 203. The other set of inputs to I201, 202 and 203 are the corresponding frequency control outputs from the serial logic board.

Functionally, I201, 202 and 203 form twelve single-pole double-throw switches. Depending on the levels of control pins 9 and 14 of each circuit, either the parallel control input or its corresponding serial control input is connected to the input of the converter logic.

As an example, assume the serial mode is selected by grounding pin H on J9051. This causes Q220 to turn off and pin 9 on each circuit is pulled high by R276. Grounding pin H also pulls pin 14 on each circuit low through CR218. In this condition, pin 15 of each circuit is effectively connected to pin 13, pin 2 to pin 12, pin 4 to pin 11, and pin 6 to pin 10. Therefore, the output from the serial logic board has been connected to the converter logic.

In the parallel mode, pin H on J9051 is open. Pins 14 are pulled high by R278. Q220 is turned on and pins 9 are pulled low. In this condition, pin 1 is connected to pin 13, pin 3 to pin 12, pin 5 to pin 11, and pin 7 to pin 10. Therefore, the parallel control frequency information is selected.

4.3.2.2 CODE CONVERSION

The frequency dividers I219 through I222 in the synthesizer require a special code of inputs to establish the proper divide ratio for a given frequency. This code of inputs is listed in Table 4-2. This divider code is derived from a unique, but not readily obvious, relationship to the BCD frequency control input. The channeling logic, I204 through I213 converts the BCD input information to the proper divider codes. Additionally, I211, 212 and 213 convert the 11 volt COSMOS logic levels to the 5 volt logic levels required by the TTL dividers.

The operation of the channeling logic is most easily understood by assuming a particular input frequency code and tracing the logic levels through the circuit.

Assume an input of 126.025MHz, parallel mode, transmit condition. The frequency control lines will be as follows: LOW: 10MHz A, 1MHz A and D, 0.1MHz A, B, C, and D, and 0.01MHz A. HIGH: 10MHz B, 1MHz B and C, and 0.01MHz B. The push-to-talk line is low and Q201 is turned off placing a high on pins 5 and 6 of I207B, pin 1 of I210A and pin 5 of I210B. The output of I207B is low causing Q202 to turn off and allowing the Receive enable line to go high. The 10MHz A line places a low on pin 2 of I210A and pin 1 of I207A. The 10MHz B line places a high on pin 2 of I205A and pin 6 of I210B. The output of I207B places a low on pin 1 of I205A. A low and a high at the input of I210A produces a high at the output. Since I212B is a noninverting buffer, the 10MHz control line is high. Two highs at the input of I210B produce a low output to pin 2 of I207A. The other input of I207A is also low. Its output is high driving buffer I212C producing a high on the 10MHz control line B. The high at pin 2 of I205A produces a low at its output and buffer I212A produces a low on the 10MHz control line C. The 10MHz control line D is always low.

The 1MHz A line places a low on pin 3 of inverter I211A producing a high on the 1MHz control line A. The 1MHz B line places a high on pin 9 of I212D producing a high on the 1MHz control line B. Two highs at the input of I210C produce a low at its output and buffer I212E produces a low on the 1MHz control line C. The highs at the inputs of I205B produce a low output and buffer I212F produces a low on the 1MHz control line D.

The KHz control 1 and control 2 lines are dependent on both the 0.1MHz and 0.01MHz frequency lines. All four 0.1MHz lines produce lows at the input pins 10, 11, 12 and 13 of I204 which is a BCD to decimal decoder. Also, the 0.1MHz D line produces lows at pin 13 of I205C and pin 2 of I206A.

The outputs of I204 are low except the one representing the decimal equivalent of its BCD input. Pin 3, representing decimal 0 is high and pins 1, 2, 4, 5, 6, 7, 9, 14 and 15 are low. The 0.01MHz A line places a low on pins 8 and 9 of I207C, pin 13 of I210D, pin 2 of I209A, and pin 13 of I209D. The 0.01MHz B line places a high at the input of inverter I211C producing a low on the KHz control 2 line A. The anodes of CR205 and CR206 are both low producing a low at pin 11 of I205C. Pin 4 of I204 places a low on pin 12 of I205C and pin 2 of I208A. Buffer I213A produces a high on the KHz control 1 line D and inverter I211B produces a low on KHz control 1 lines B and C. Pin 15 of I204 places a low on pin 3 of I206A and pin 11 of I205B. Pin 1 of I204 places a low on pin 4 of I206A. Pin 2 of I204 places a low on pin 1 of I208A. The two lows at the input of I208A produce a high on pin 5 of I208B. The lows at the input of I207C produce a high at pin 6 of I208B and pin 9 of I209C. The highs at the input of I208B produce a low at pin 5 of I206A and pin 5 of I209B. The lows at the inputs of I206A produce a high at pins 12 and 13 of I207D and buffer I213B places a high on the KHz control 1 line A.

The highs at the inputs of I207D produce a low at pin 12 of I210D. The two lows at the input of I210D produce a low at its output and buffer I213C places a low on KHz control 2 line B. Pin 6 of I204 produces a low at pin 9 of I208C and pin 3 of I204 produces a high at pin 8 of I208C. This high produces a low at pin 1 of I209A and pin 8 of I209C. The lows at the inputs of I209A produce a high at pin 6 of I209B. This high produces a low at the input of inverter I211D which places a high on the KHz control 2 line D. Pin 7 of I204 produces a low on pin 13 of I208D and pin 14 of I204 produces a low on pin 12 of I208D. These lows produce a high at pin 12 of I209D. This high produces a low at pin 10 of I206B. Pin 9 of I204 produces a low at pin 12 of I206B. The lows at the input of I206B produce a high at its output and inverter I211E places a low on KHz control 2

line C. Inverters I211D and F and buffers I213E and F are unused so their inputs are grounded.

4.3.2.3 TRANSMIT-RECEIVE SWITCHING

When the transceiver is switched to the receive mode, the push-to-talk line goes high causing Q201 to turn on. This places a low at pins 5 and 6 of I207B, pin 1 of I210A, and pin 5 of I210B. The output of I207B goes high causing Q202 to turn on and pull the Receive Enable line low. Pin 1 of I205A also goes high; however, its output remains unchanged and the 10MHz control line C remains low. The inputs to I210A are now both low so the outputs go low, and the 10MHz control line A goes low. Pin 5 of I210B goes low causing its output to place a high on pin 2 of I207A. Since pin 1 of I207A stays low, its output remains high and the 10MHz control line B remains high.

Referring to the divider coding chart Table 4-2, this coding corresponds to 136MHz. Since the 1MHz and KHz control lines remain unchanged the synthesizer will now produce an output 10.0MHz above the transmit frequency.

4.3.3 SERIAL LOGIC

4.3.3.1 GENERAL

All of the digital logic used in the serial logic assembly is of the complementary metal oxide silicon type, C-MOS for short. This type of logic is characterized by a very high input impedance, many megohms, and a relatively low output impedance, several hundred ohms. The various gate and inverter inputs require almost no current to activate them. The serial logic is operated from a +11.0VDC power supply.

4.3.3.2 ONE-SHOT MULTIVIBRATORS

The one-shot multivibrators formed by I101A-101B, I101C-101D, and I102D-102E are identical in principle; therefore, only the operation of I101A-101B will be described in detail.

The input of I101B is held to ground by R102 causing the output of I101B to be high (11 volts). The voltage divider formed by R101 and R112 places almost all of this voltage at the input of I101A, causing its output which is the output of the one-shot, to be low. This is the so-called rest or stable state of the circuit.

The serial data input normally rests high (14 volts). This is coupled through R113 to C101. CR101 and CR102 prevent the input of I101A from being forced higher than its supply voltage.

When the leading edge of a data bit appears at the input, C101 momentarily couples this voltage to the input of I101A since the voltage across C101 cannot change instantaneously. This causes the output of I101A to go high. C102 couples this high to the input of I101B causing its output to go low. This is the active or unstable state of the circuit.

Capacitor C102 immediately begins to charge to supply voltage through R102. When the output of C102 has decreased past the threshold input voltage of I101B, the output of I101B switches back to its high state which charges C101 and the input of I101A goes high. The output of I101A goes low and the cycle is complete. The time constant of R102 and C102 determines the operating period of the circuit.

SECTION VI

MAINTENANCE

6.1 GENERAL INFORMATION

The following is a discussion of semiconductor and integrated circuit maintenance.

6.1.1 SEMICONDUCTOR MAINTENANCE

6.1.1.1 GENERAL

Due to the wide utilization of semiconductors in this electronic equipment, somewhat different techniques are necessary in maintenance procedures. In solid state circuits the impedances and resistances encountered are of much lower values than those encountered in vacuum-tube circuits. Therefore, a few ohms discrepancy can greatly affect the performance of the equipment. Also, coupling and filter capacitors are of larger values and usually are of the tantalum type. Hence, when measuring values of capacitors, an instrument accurate in the high ranges must be employed. Capacitor polarity must observed when measuring resistance. Usually more accurate measurements can be obtained if the semiconductors are removed or disconnected from the circuit.

6.1.1.2 SEMICONDUCTOR TEST EQUIPMENT

Damage to semiconductors by test equipment is usually the result of accidentally applying too much current or voltage to the elements. Common causes of damage from test equipment are discussed in the following paragraphs.

(1) Transformerless Power Supplies. Test equipment with tranformerless power supplies is one source of high current. However, this type of test equipment can be used by employing an isolation transformer in the AC power line.

(2) Line Filter. It is still possible to damage semiconductors from line current, even though the test equipment has a power transformer in the power supply, if the test equipment is provided with a line filter. This filter may function as a voltage divider and apply half voltage to the semiconductor. To eliminate this condition, connect a ground wire from the chassis of the test equipment to the chassis of the equipment under test before making any other connections.

(3) Low-Sensitivity Multimeters. Another cause of semiconductor damage is a multimeter that requires excessive current to provide adequate indications. Multimeters with sensitivities of less than 20,000 ohms-per-volt should not be used on semiconductors. When in doubt as to the amount of current supplied by a multimeter, check the multimeter circuits on all scales with an external, low-resistance multimeter connected in series with the multimeter leads. If more than one milliampere is drawn on any range, this range cannot be safely used on small semiconductors.

(4) Power Supply. When using a battery-type power supply, always use fresh batteries of the proper value. Make certain that the polarity of the power supply is correct for the equipment under test. Do not use power supplies having poor voltage regulation.

6.1.1.3 SEMICONDUCTOR VOLTAGE AND RESISTANCE MEASUREMENTS

When measuring voltage or resistance in circuits containing semiconductor devices, remember that these components are polarity and voltage conscious. Since the values of capacitors used in semiconductor circuits are usually large, time is required to charge these capacitors when they appear. Thus, any reading obtained is subject to error if sufficient time is not allowed for the capacitor to fully charge. When in doubt it may be best in some cases to isolate the components in question and measure them individually.

6.1.1.4 TESTING OF TRANSISTORS

A transistor checker should be used to properly evaluate transistors. If a transistor tester is not available, a good multimeter may be used. Make sure that the multimeter meets the requirements outlined in the preceding paragraphs.

(1) PNP Transistor. To check a PNP transistor, connect the positive lead of the multimeter to the base of the transistor and the negative lead to the emitter. Generally, a resistance reading of 50,000 ohms or more should be obtained. Reconnect the multimeter with the negative lead to the base. With the positive lead connected to the emitter a resistance value of 500 ohms or less should be obtained.

(2) NPN Transistor. Similar tests made on an NPN transistor should produce the following results: With the negative lead of the multimeter connected to the base of the transistor the value of resistance between the base and the collector should be high. With the positive lead of the multimeter connected to the base, the value of resistance between the base and the collector should be low. If these results are not obtained, the transistor is probably defective and should be replaced.

CAUTION

IF A TRANSISTOR IS FOUND TO BE DEFECTIVE, MAKE CERTAIN THAT THE CIRCUIT IS IN GOOD OPERATING ORDER BEFORE INSTALLING A REPLACEMENT TRANSISTOR. IF A SHORT CIRCUIT EXISTS IN THE CIRCUIT, PUTTING IN ANOTHER TRANSISTOR WILL MOST LIKELY RESULT IN BURING OUT THE NEW COMPONENT. DO NOT DEPEND UPON FUSES TO PROTECT TRANSISTORS.

(3) Always check the value of the bias resistors in series with the various transistor elements. A transistor is very sensitive to improper bias voltage; therefore, a short or open circuit in the bias resistance may damage the transistor.

6.1.1.5 REPLACING SEMICONDUCTORS

Never remove or replace a semiconductor with the supply voltage turned on. Transients thus produced may damage the semiconductor or others remaining in the circuit. If a semiconductor is to be evaluated in an external test circuit, be sure that no more voltage is applied to the semiconductor than normally is used in the circuit from which it came.

(1) Use only a low heat soldering iron when installing or removing soldered-in parts.

(2) When installing or removing a soldered-in semiconductor grasp the lead to which heat is applied between the solder joint and the semiconductor with long nosed pliers. This will dissipate some of the heat that would otherwise conduct into the semiconductor from the soldering iron. Make certain that all wires soldered to semiconductor terminals have first been properly tinned so that the necessary connection can be made quickly. Excessive heat will permanently damage a semiconductor.

(3) In some cases, power transistors are mounted on heat-sinks that are designed to dissipate heat away from them. In some power circuits, the transistor must also be insulated from ground. Often, this insulating is accomplished by means of insulating washers made of mica. When replacing transistors mounted in this manner, be sure that the insulating washers are replaced in proper order. Before installing the mica washers, treat them with a film of thermal compound (King Part Number 016-1004-00). This treatment helps in the transfer of heat. After the transistor is mounted, and before making any connections, check from the case of the transistor to ground with a multimeter to see that the insulation is effective.

6.1.2 INTEGRATED CIRCUIT (I. C.) MAINTENANCE

6.1.2.1 GENERAL

A knowledge of integrated circuit fundamentals is as necessary in testing digital logic circuits involving I. C. 's as a knowledge of rectification fundamentals is needed to test a power supply.

6.1.2.2 TERMINOLOGY

Several terms are used whenever logic circuits are discussed:

(1) A logic state is defined as a high or low level voltage applied to the input or seen at the output of a device. A high level voltage is called a logic "1". A low level voltage is called a logic "0".

(2) A truth table is a list of input logic states that will yield certain output logic states. A digital logic element should be thought of as a circuit element with its output level being either HI or LO as programmed by the levels present on its inputs. A logic element may be tested by verifying that it is performing per the Truth Table of that logic element.

(3) Logic elements which have multiple inputs and a single output are known as gates. The OR gate produces a HI output when one OR more of the inputs are HI. With all inputs LO, the output is LO. The AND gate produces a HI output only when all inputs are HI. When any input is LO the output is LO. A small circle at the output of a gate on the schematics indicates "negation", which means that the sense of the gate logic is reversed. An OR gate with negation is called a NOR gate and an AND gate with negation is called a NAND gate. A NOR gate produces a LO output when one or more of the inputs are HI and a NAND gate produces a LO output only when all inputs are HI.

(4) The Flip-Flop logic element is the basic data storage element of digital logic. It has two outputs that are always at opposite logic levels that is, when one output is HI, the other output is LO. The flip-flop will remain in a particular state until that state is changed by an input signal.

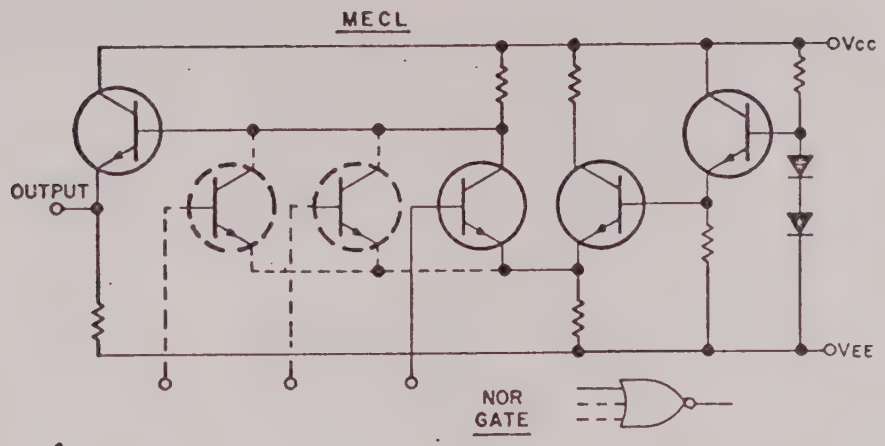
The operation of these flip-flops is controlled by the signals on their inputs, and is best understood by a careful study of their Truth Tables. It should be kept in mind that the small circle on either the input or output indicates negation. Also, a circle on a clock input indicates that a HI to LO transition causes the flip-flop to function.

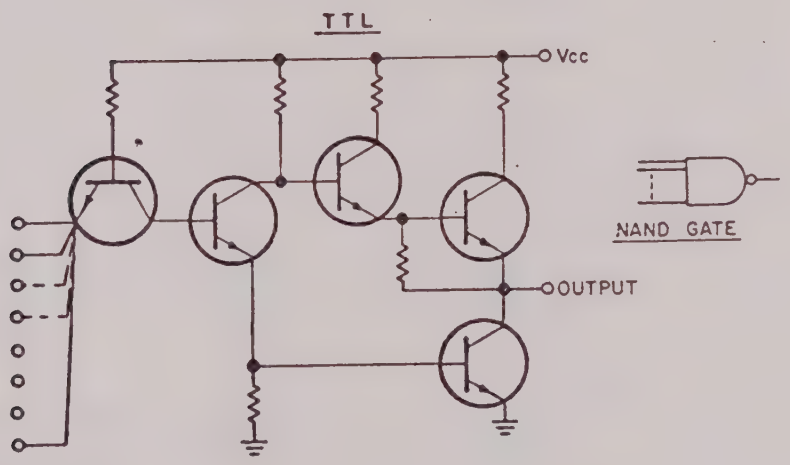
(5) Besides the gates and flip-flops, two other commonly used logic elements are inverters and expanders. Inverters are merely switching transistors such that if a logic "1" is the input to a device, a logic "0" will be the output and vice versa. An expander is a set of parallel switching transistors that depends upon another resistor to provide their supply voltage. Generally these devices are used to expand the number of inputs available to a standard gate.

(6) Three types of logic circuitry are used in the KTR 905. These are Transistor-Transistor Logic (TTL), Current Mode Logic (MECL), and Complementary Field Effect Logic (COS/MOS). Typical supply voltages are +5.0VDC for TTL and MECL and 11.0VDC for COS/MOS. Typical gate schematics are shown in Figure 6-1. Basic gates, inverters, expanders, and JK flip-flops are defined symbolically and functionally in Figure 6-2.

6.1.2.3 SPECIAL LOGIC CIRCUITS

A counter is used to provide one output pulse for every N input pulses. This means F(out) = F(in) /N. In a programmable counter N may be selected from any one of several choices. Programmable counters are divided into two classifications; reset counters and preset counters. The reset counter uses the principle that when the counter reaches a selected load state it sets to a fixed reset state and then recycles. The preset counter reaches a fixed load state, sets to a selected preset state and recycles.





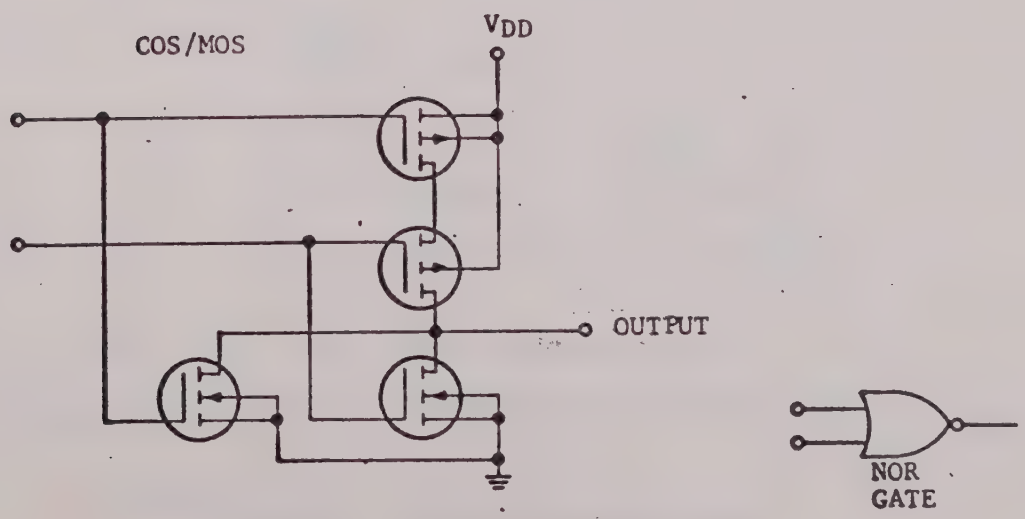
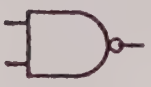
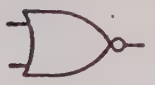
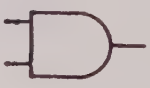
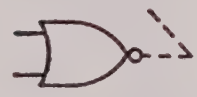


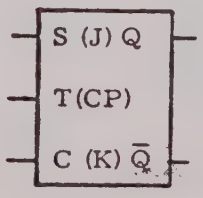
FIGURE 6-1 TYPICAL GATE CIRCUITS

I. GATES, INVERTERS and EXPANDERS

		Inputs	Outputs
A.	NAND 	All high (1) Any low (0)	Low (0) High (1)
B.	NOR 	All low (0) Any High (1)	High (1) Low (0)
C.	AND 	All high (1) Any low (0)	High (1) Low (0)
D.	OR	All low (0) Any high (1)	Low (0) High (1)
E.	INVERTER	High (1) Low (0)	Low (0) High (1)
F.	EXPANDER 	All low (0) Any high (1)	High (1) Low (0)

II. CLOCKED J-K FLIP FLOPS

TTL		Q After Next Clock Pulse
J	K	
0	0	Output unchanged
0	1	0
1	1	Output changes state
1	0	1



Change of state caused by clock pulse negative transistion.

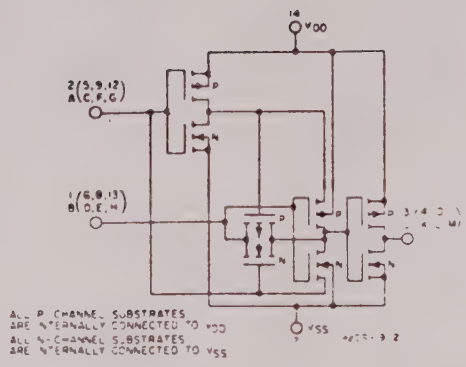
In a J-K flip-flop, output changes are initiated by the clock pulse according to the state of the J-K inputs at the time of the clock pulse transition.

FIGURE 6-2 BASIC LOGIC FUNCTIONS

TRUTH TABLE FOR ONE OF FOUR IDENTICAL GATES

A	B	J
0	0	0
1	0	1
0	1	1
1	1	0

WHERE "1" = HIGH LEVEL
"0" = LOW LEVEL



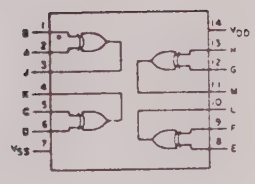


FIGURE 6-3 CD 4030A

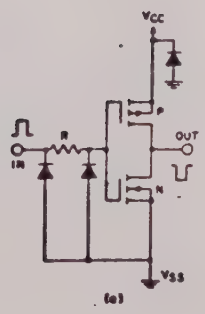
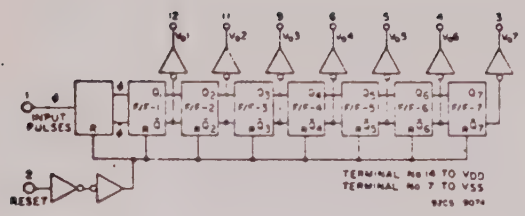


FIGURE 6-4 CD4049A



Functional diagram for CD4024AD, AK, AE, AF.

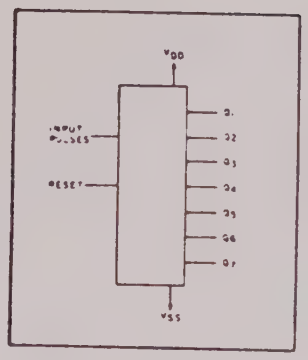


FIGURE 6-5 CD4024AD, AK, AE

TABLE I – TRUTH TABLE

D	C	B	A	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0	0
0	0	1	1	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0
0	1	1	1	0	0	0	0	0	0	0	1	0
1	0	0	0	0	0	0	0	0	0	0	0	1
1	0	0	1	0	0	0	0	0	0	0	0	1

WHERE 1=HIGH LEVEL
0=LOW LEVEL

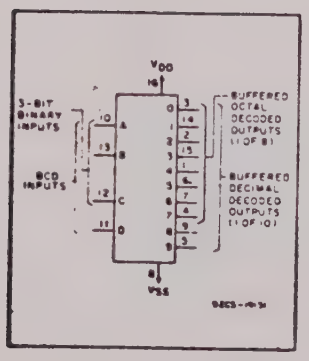


FIGURE 6-6 CD4028A

TRUTH TABLE

CL*	D	R	Q_1	Q_n	
↗	0	0	0	Q_{n+1}	
↗	1	0	1	Q_{n+1}	
↘	X	0	Q_1	Q_n	(NO CHANGE)
X	X	1	0	0	

*= LEVEL CHANGE
X= DON'T CARE CASE

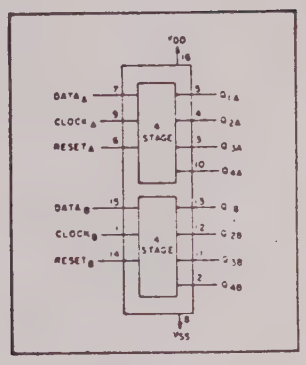
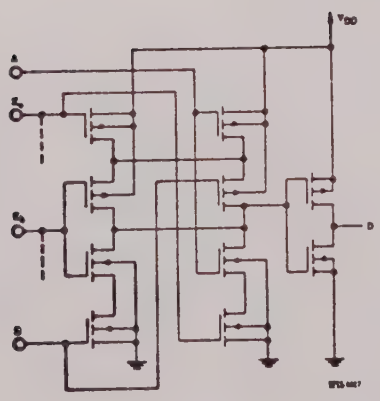


FIGURE 6-7 CD4015A



Schematic diagram for 1 of 4 identical stages.

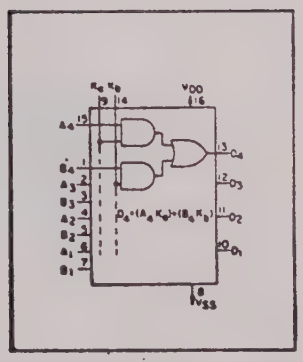


FIGURE 6-8 CD4019A

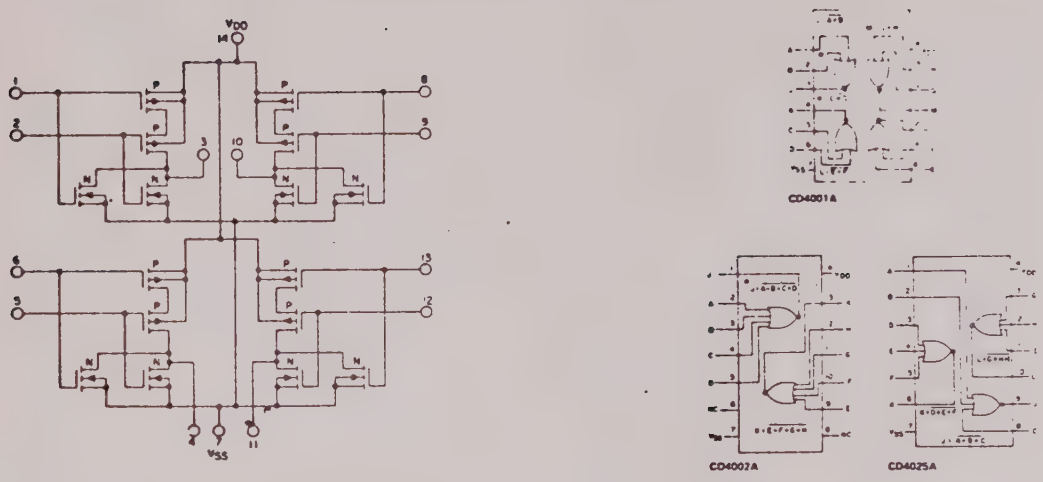


FIGURE 6-9 CD4001A, CD4002A, CD4025A

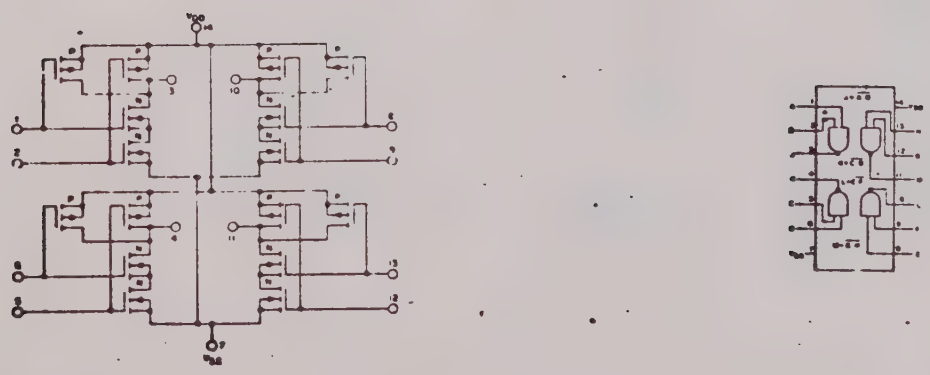
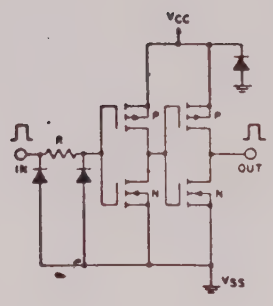


FIGURE 6-10 CD4011A



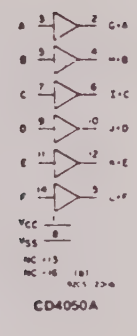
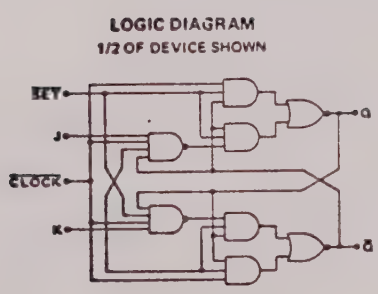
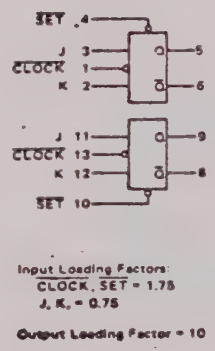


FIGURE 6-11 CD4050A





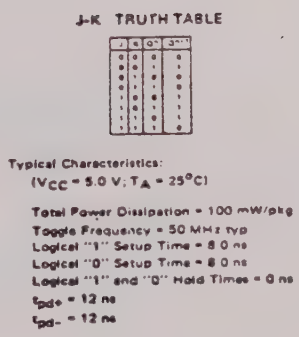


FIGURE 6-12 MC3162L

FIGURE 6-13 SN54L00

FIGURE 6-14 SN5400

TRUTH TABLE (Each Flip-Flop)

t_n	t_{n+1}	
INPUT	OUTPUTS	
D	Q	$\overline{Q}$
L	L	H
H	H	L

H = high level, L = low level

NOTES: A. t_n = bit time before clock pulse.
B. t_{n+1} = bit time after clock pulse.

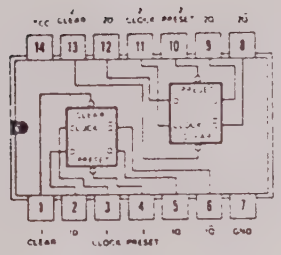


FIGURE 6-15 SN54L74

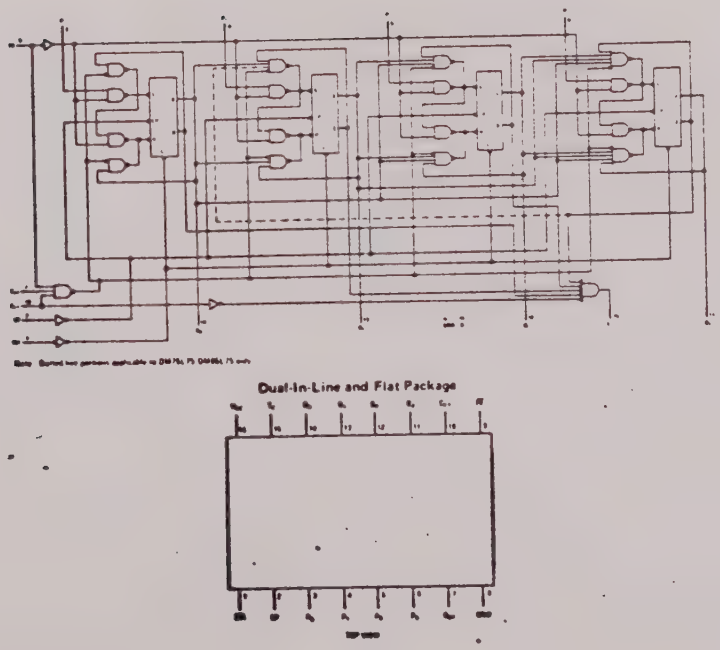
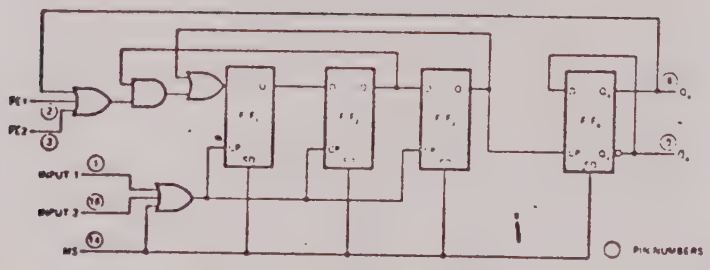


FIGURE 6-16 DM76L75, DM76L76

LOGIC DIAGRAM



COUNT SEQUENCE

Q_1	Q_2	Q_3	Q_4
H	H	H	H
L	H	H	H
L	L	H	H
L	L	L	H
H	L	L	H
H	H	L	H
L	H	H	L
L	L	H	L
L	L	L	L
H	L	L	L
H	H	L	L

NOTE: "HHHH" is set state and additional state for ÷11 mode.

LOGIC SYMBOL

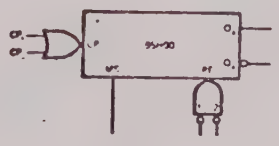


FIGURE 6-17. 95H90

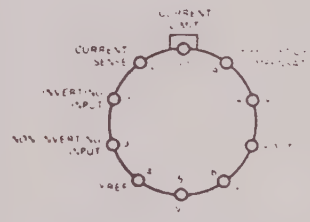
GENERAL DESCRIPTION – The μA723 is a monolithic voltage regulator constructed on a single silicon chip using the Fairchild Planar* epitaxial process. The device consists of a temperature compensated reference amplifier, error amplifier, power series pass transistor and current limit circuitry. Additional NPN or PNP pass elements may be used when output currents exceeding 150 mA are required. Provisions are made for adjustable current limiting and remote shutdown. In addition to the above, the device features low standby current drain, low temperature drift and high ripple rejection. The μA723 is intended for use with positive or negative supplies as a series, shunt, switching or floating regulator. Applications include laboratory power supplies, isolation regulators for low level data amplifiers, logic card regulators, small instrument power supplies, airborne systems and other power supplies for digital and linear circuits.

- POSITIVE OR NEGATIVE SUPPLY OPERATION
- SERIES, SHUNT, SWITCHING OR FLOATING OPERATION
- .01% LINE AND LOAD REGULATION
- OUTPUT VOLTAGE ADJUSTABLE FROM 2 TO 37 VOLTS
- OUTPUT CURRENT TO 150 mA WITHOUT EXTERNAL PASS TRANSISTOR

ABSOLUTE MAXIMUM RATINGS

Pulse Voltage from V^+ to V^-, (50 ms) (312 Grade)	50 V
Continuous Voltage from V^+ to V^-	40 V
Input-Output Voltage Differential	40 V
Differential Input Voltage	±5 V
Voltage Between Non-Inverting Input and V^-	+8 V
Current from V_Z	25 mA
Current from V_{REF}	15 mA
Internal Power Dissipation (Note 1)	
Metal Can	800 mW
Ceramic DIP	1000 mW
Silicone DIP	620 mW
Storage Temperature Range	
Metal Can, Ceramic DIP	−65°C to +150°C
Silicone DIP	−55°C to +125°C
Operating Temperature Range	
Military (312 Grade)	−55°C to +125°C
Commercial (393 Grade)	0°C to + 70°C
Lead Temperature	
Metal Can, Ceramic DIP (Soldering, 60 seconds)	300°C
Silicone DIP (Soldering, 10 seconds)	260°C

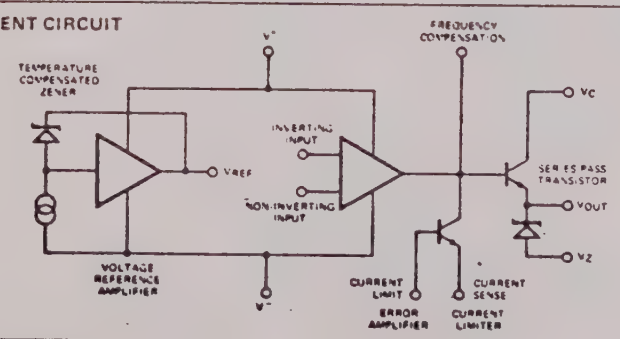
CONNECTION DIAGRAMS
(TOP VIEW)
10 LEAD METAL CAN



Note: Pin 5 connected to case.

ORDER PART NOS: U5R7723312
U5R7723393

EQUIVALENT CIRCUIT



Notes on following pages.

FIGURE 6-18 μA723
(Dwg. No. 696-3155-00)

The SN52558 and SN72558 are dual high-performance operational amplifiers with each half electrically similar to SN52741, SN72741 except that offset null capability is not provided.

The high common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage-follower applications. The devices are short-circuit protected and the internal frequency compensation ensures stability without external components.

The SN52558 is characterized for operation over the full military temperature range of −55°C to 125°C, the SN72558 is characterized for operation from 0°C to 70°C.

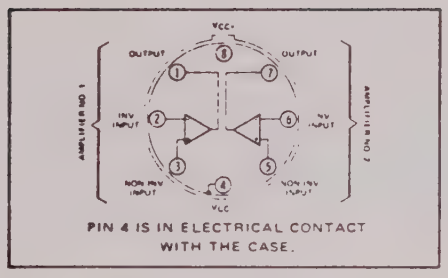


FIGURE 6-19 SN52558L

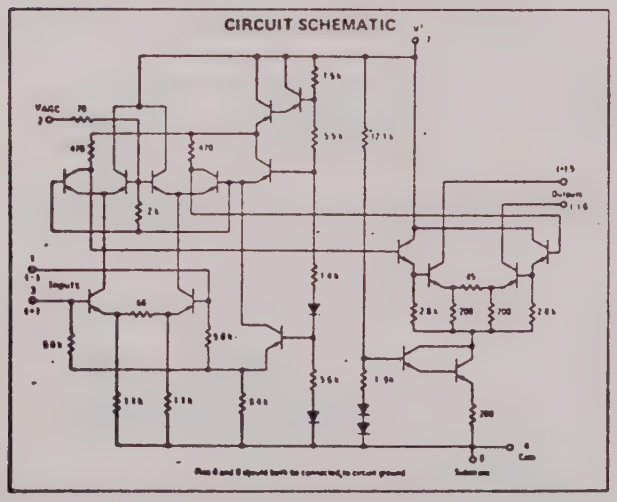


FIGURE 6-20 MC1590G

6.1.2.4 INTEGRATED CIRCUIT TEST EQUIPMENT

As with semiconductors, damage to integrated circuits by test equipment is usually the result of applying too much current or voltage to the elements. The same precautions as discussed in 6.1.1.2 apply here.

6.1.2.5 VOLTAGE MEASUREMENTS

Precise voltage measurements are not needed in testing digital I. C. 's other than to see that the voltage is a HI level or a LO level. An oscilloscope is needed where the input levels are of short duration, either HI or LO. For instance, if a 10 microsecond pulse going from LO to HI was applied to one input of a NOR gate, while the other input stayed LO, the output would go LO for 10 microseconds and then return HI. This, of course, could not be seen without an oscilloscope.

6.1.2.6 TESTING INTEGRATED CIRCUITS

The minimum high and maximum low levels on the digital logic elements are as follows:

COS/MOS (V_{DD} = +11v)		TTL (V_{cc} = +5v)		MECL (V_{cc} = +5v)	
HIGH	LOW	HIGH	LOW	HIGH	LOW
+10.9v	+0.1v	+2.10v	+0.70v	+4.20v	+3.90v

When checking input and output levels of a logic element under question it should be remembered that an input or output may not agree with its truth table not because it has malfunctioned but because some other component connected to the same point has shorted to ground or to the supply voltage (V_{cc} or V_{DD}). This is not common when an output of one element is connected to an input of another. A majority of digital I. C. failures can be grouped into three categories.

1. Input(s) or output shorted to ground pin of I. C.
2. Input(s) or output shorted to V_{cc} or V_{DD} pin of I. C.
3. Open input(s) or output.

An input or output shorted to ground would be a constant LO and an input or output shorted to V_{cc} or V_{DD} would be a constant HI.

Other failures common in digital I. C. 's are:

1. Ground pin open.
2. V_{cc} or V_{DD} pin open.
3. Inputs shorted together.

An open ground pin would not allow a LO on the output. An open V_{cc} or V_{DD} pin would not allow a HI on the output (Remember to isolate the device from other components connected to it). Two or more inputs shorted together can be checked by grounding one of the inputs under question. If the other input also goes to ground they are probably shorted.

CAUTION

If an I. C. is found to be defective verify that proper power supply voltages are present before installing a replacement I. C.

6.1.2.7 REPLACING INTEGRATED CIRCUITS

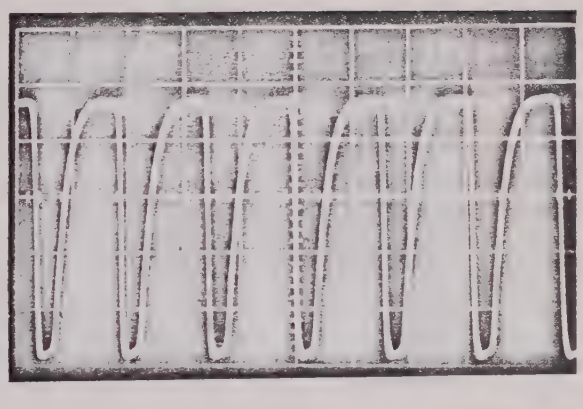
If an I. C. is known to be defective, the easiest way to remove it is to cut off each of its pins, remove the case, and then unsolder the remaining pins from the integrated circuit card one by one. This is preferrable over removing the I. C. intact because attempts to remove the I. C. intact may result in damage to the printed circuit board.

SECTION	SYMPTOM	POSSIBLE CAUSE
~~Transmitter Power Output~~	~~Test "B" D. C. level fails~~	~~R403 faulty~~ ~~I307 defective~~ ~~CR320 shorted~~ ~~Q315 faulty~~ ~~I306B faulty~~
~~Transmitter Modulation~~	~~Test "B" fails~~	~~R399 faulty~~ ~~I305 faulty~~ ~~Q314 faulty~~ ~~R389 faulty~~ ~~C358 faulty~~ ~~Q313 faulty~~ ~~I306A faulty~~
~~Transmitter Modulation~~	~~Down-Mod Distorted~~	~~CR506 faulty~~ ~~CR507 faulty~~
~~Transmitter Modulation~~	~~Up-Mod Distorted~~	~~Try various values for C525 and C527~~
~~Transmitter VSWR~~	~~VSWR limit can't be set~~	~~CR507 faulty~~ ~~R407 faulty~~ ~~I307A faulty~~ ~~CR320 open~~
Frequency Synthesizer	Incorrect Code to I201, 202, 203 (see Table 6-2)	CR219-CR230 faulty Parallel C266-C277 shorted logic mode ~~I106-I109 faulty Serial~~ ~~I104, I105 faulty logic mode~~
Frequency Synthesizer	Incorrect Code to I219-I222 (see Table 6-3)	I204-I213 faulty (See level given in Table 6-4)
Frequency Synthesizer	Incorrect (or no) ref. phase at TP205	I223 faulty I224 faulty Y201 faulty Q218 faulty Q219 faulty
Frequency Synthesizer	No VCO Signal	CR209 faulty L204 faulty C260 faulty Q209 faulty

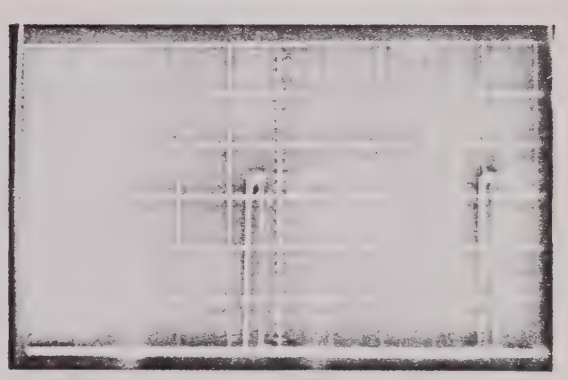
SECTION	SYMPTOM	POSSIBLE CAUSE
Frequency Synthesizer	I215 #9 Waveform incorrect	Q215 faulty Q216 faulty I214 faulty Q217 faulty I215 faulty
Frequency Synthesizer	I218 #6 Waveform incorrect	I221 faulty I218B faulty I222 faulty
Frequency Synthesizer	Collector Q208 Waveform incorrect	I216 faulty I217 faulty Q208 faulty
Frequency Synthesizer	Whole MHz channeling incorrect	FL201 faulty CR208 faulty C206 faulty
Frequency Synthesizer	Fractional MHz channeling incorrect	I219 faulty I220 faulty I218 faulty
Frequency Synthesizer	Locked-up, but no output from either buffer	Q203 faulty Q204 faulty Q205 faulty Q206 faulty Q207 faulty
Frequency Synthesizer	Tx buffer inoperative	Q207 faulty Q212 faulty Q213 faulty Q214 faulty Q202 faulty
Frequency Synthesizer	Rx buffer inoperative	Q205 faulty Q210 faulty Q211 faulty Q202 faulty

SYNTHESIZER WAVEFORMS

TP: TP203
Vert: 1v/cm
Horiz: .2μsec/cm
Coupling: DC
Sync: int.
Conditions: 126.50MHz (receive)



TP: I224 #2
Vert: 1v/cm
Horiz: 1μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)



TP: TP205
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)

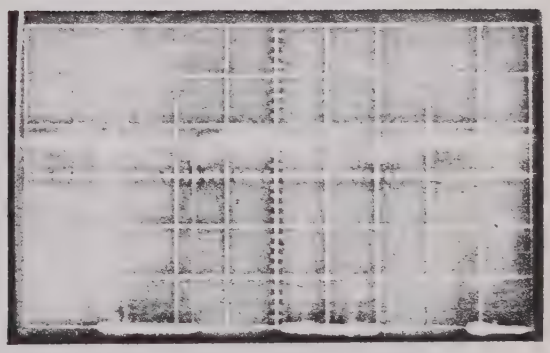
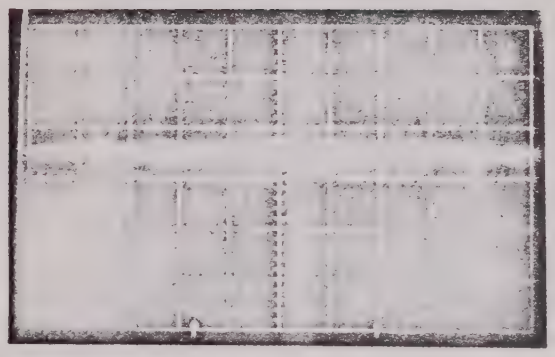
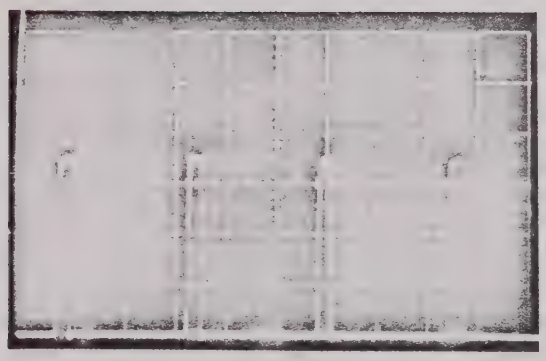


FIGURE 6-26A SYNTHESIZER WAVEFORMS

TP: TP207
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions: 126.50MHz (receive)



TP: I222 #7
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)



TP: I215 #9
Vert: 1v/cm
Horiz: .2μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)

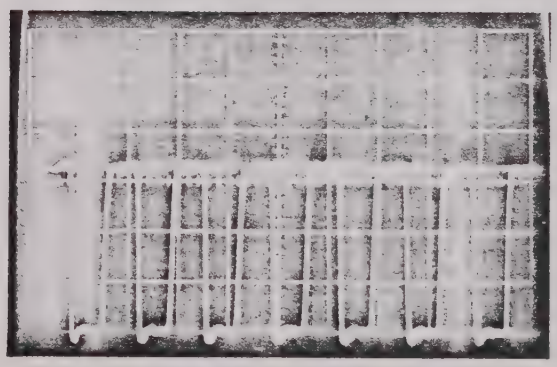
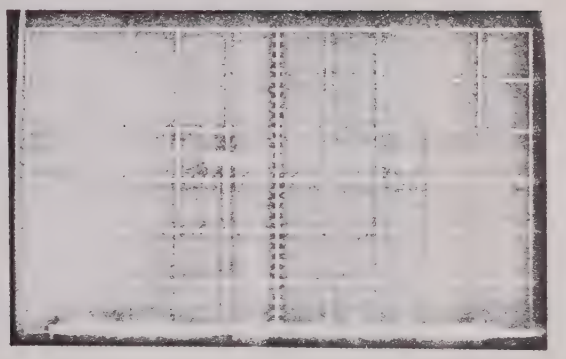
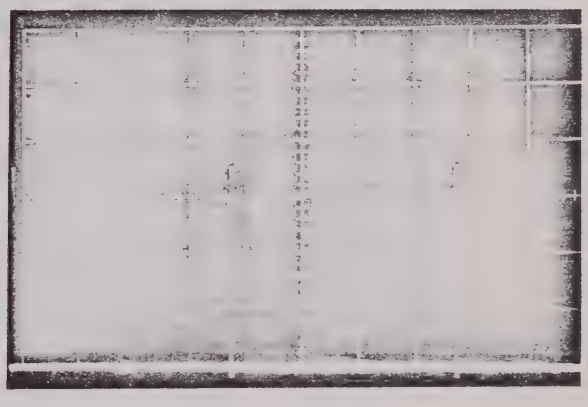


FIGURE 6-26B SYNTHESIZER WAVEFORMS

TP: I218 #3
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)



TP: I216 #6
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)



TP: I216 #8
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)

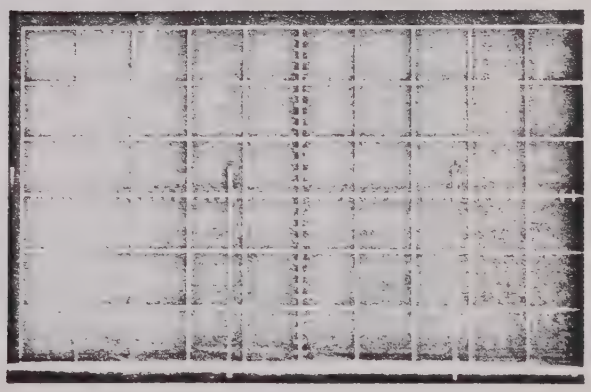
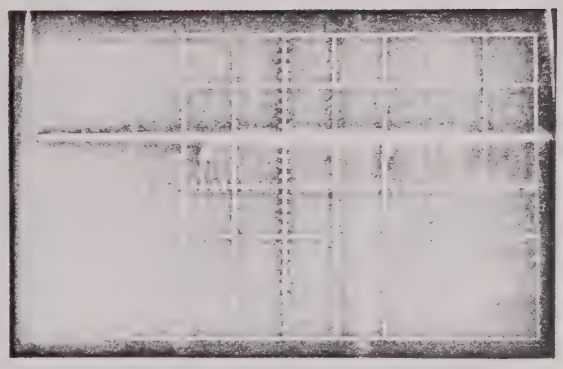


FIGURE 6-26C SYNTHESIZER WAVEFORMS

TP: I217 #8
Vert: 1v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)



TP: I217 #11
Vert: 2v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)

TP: Collector Q208
Vert: 5v/cm
Horiz: 10μsec/cm
Coupling: DC
Sync: int.
Conditions - 126.50MHz (receive)

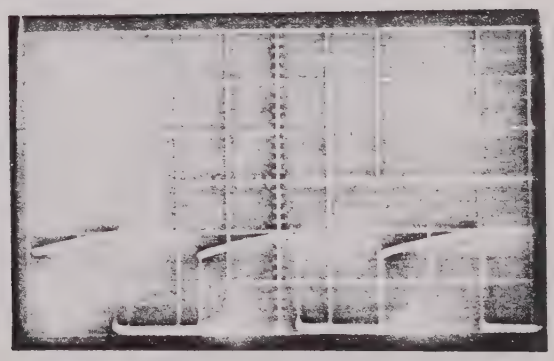


FIGURE 6-26D SYNTHESIZER WAVEFORMS

CHANNELING LOGIC INTERNAL LEVELS - TABLE 6-4

This tabulation gives channeling logic integrated circuit levels for 7 different synthesizer frequencies. The tables are keyed as a 1 indicating a "high" (+5VDC or +11VDC depending on the integrated circuit) or "0" indicating a "low" (ground).

It should be noted that the outputs from I201, I202, and I203 are identical to their inputs from the serial logic board when their pins #14 are "low" (pins #10 "high") and identical to their inputs from the parallel control coding lines when their pins #14 are "high" (pins #10 "low").

PIN / FREQ	I204															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
119.025	0	0	1	0	0	0	0		0	0	0	1	0	0	0	
126.500	0	0	0	0	0	1	0		0	1	0	1	0	0	0	
127.400	1	0	0	0	0	0	0		0	0	0	1	0	0	0	
134.150	0	0	0	0	0	0	0		0	1	0	0	0	1	0	
135.975	0	0	0	0	1	0	0		0	1	1	0	0	0	0	
135.975 (T)	0	0	0	0	1	0	0		0	1	1	0	0	0	0	

PIN / FREQ	I205															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	1	0	0	0	1	0		0	0	1	0	0	0			
119.025	1	0	0	0	1	0		0	0	1	0	0	0			
126.500	1	1	1	1	0	0		0	0	0	1	0	0			
127.400	1	1	1	1	0	0		0	0	1	0	0	0			
134.150	1	1	0	1	0	0		0	0	1	0	0	0			
135.975	1	1	0	1	0	0		0	0	0	0	0	1			
135.975 (T)	0	1	0	1	0	0		0	0	0	0	0	1			

PIN / FREQ	I206															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	1	0	0	0	0	0	0		0	0	0	0	0	0	0	
119.025	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
126.500	0	0	0	0	0	1	0		0	1	0	1	0	0	0	
127.400	1	0	0	0	0	0	0		0	0	0	1	0	0	0	
134.150	0	0	0	0	0	0	0		0	1	0	0	0	1	0	
135.975	0	0	0	0	1	0	0		0	1	1	0	0	0	0	
135.975 (T)	0	0	0	0	1	0	0		0	1	1	0	0	0	0	

PIN / FREQ	I207															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	1	0	1	1	0	0		0	0	1	0	1	1			
119.025	1	0	1	1	0	0		0	0	1	0	1	1			
126.500	0	1	1	1	0	0		0	0	1	0	1	1			
127.400	0	1	1	1	0	0		0	0	1	1	0	0			
134.150	1	1	0	1	0	0		1	1	0	0	1	1			
135.975	1	1	0	1	0	0		1	1	0	1	0	0			
135.975 (T)	1	0	1	0	1	1		1	1	0	1	0	0			

PIN / FREQ	I208															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	0	0	1	0	1	1		1	0	0	1	0	0			
119.025	0	0	1	0	1	1		1	0	0	1	0	0			
126.500	0	0	1	0	1	1		0	1	0	1	0	0			
127.400	0	0	1	0	1	1		0	0	1	1	0	0			
134.150	0	0	1	0	1	0		0	0	1	0	0	1			
135.975	0	0	1	0	1	0		0	0	1	1	0	0			
135.975 (T)	0	0	1	0	1	0		0	0	1	1	0	0			

PIN / FREQ	I209															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	0	0	1	0	0	1		0	1	0	0	1	0			
119.025	0	0	1	0	0	1		0	1	0	0	1	0			
126.500	0	0	1	0	0	1		0	1	0	0	1	0			
127.400	1	0	0	1	0	0		1	1	0	0	0	0			
134.150	1	1	0	1	0	0		1	0	0	0	0	1			
135.975	1	1	0	1	0	0		1	0	0	0	1	1			
135.975 (T)	1	1	0	1	0	0		1	0	0	0	1	1			

PIN / FREQ	I210															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000	0	1	1	0	0	0		0	0	0	0	0	0			
119.025	0	1	1	0	0	0		0	0	0	0	0	0			
126.500	0	0	0	1	0	1		1	1	0	0	0	0			
127.400	0	0	0	1	0	1		1	1	0	1	1	0			
134.150	0	1	1	1	0	1		0	1	1	1	0	1			
135.975	0	1	1	1	0	1		0	1	1	0	1	1			
135.975 (T)	1	1	0	0	1	1		0	1	1	0	1	1			

PIN / FREQ	I211															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000		1	0	0	1	1	0		0	1	0	1		0	1	
119.025		0	1	0	1	0	1		0	1	0	1		0	1	
126.500		1	0	1	0	1	0		0	1	0	1		0	1	
127.400		0	1	0	1	1	0		1	0	0	1		0	1	
134.150		1	0	0	1	1	0		1	0	0	1		0	1	
135.975		0	1	1	0	0	1		1	0	0	1		0	1	
135.975 (T)		0	1	1	0	0	1		1	0	0	1		0	1	

PIN / FREQ	I212															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000		0	0	1	1	1	1		0	0	0	0		0	0	
119.025		0	0	1	1	1	1		0	0	0	0		0	0	
126.500		0	0	0	0	1	1		1	1	0	0		0	0	
127.400		0	0	0	0	1	1		1	1	0	0		0	0	
134.150		0	0	1	1	0	0		0	0	1	1		0	0	
135.975		0	0	1	1	0	0		0	0	1	1		0	0	
135.975 (T)		0	0	0	0	1	1		0	0	1	1		0	0	

PIN / FREQ	I213															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
118.000		1	1	1	1	0	0		0	0	0	0		0	0	
119.025		1	1	0	0	0	0		0	0	0	0		0	0	
126.500		0	0	0	0	0	0		0	0	0	0		0	0	
127.400		1	1	1	1	1	1		0	0	0	0		0	0	
134.150		1	1	0	0	1	1		0	0	0	0		0	0	
135.975		0	0	0	0	0	0		0	0	0	0		0	0	
135.975 (T)		0	0	0	0	0	0		0	0	0	0		0	0	

SMO AND MODULATOR CALIBRATION

There is very little calibration to the S.M.O. Push the select button and the select L.E.D. should be lit. Dial in 122.000Mhz. Allow the generator to stabilize at least 2 hours with covers on, before making the next adjustment. Turn the modulation off. Adjust the fine frequency, adjust capacitor for 122.000 Mhz ± 100Hz. This cap is on the rear of the generator.

The next adjustment is the R.F. automatic level control circuit. This is also done with the modulation off. Connect a R.F. Power meter to the B.N.C. output of the generator. Set the generator to 122.000 Mhz. and the R.F. Attenuator to -10db. Adjust the R.F. level pot until the power meter reads -10db. Dial in 108.000 Mhz and adjust the R.F. Age pot until the reading is -10db ± 3db. Dial in 136.000 Mhz and adjust the R.F. level and the R.F. Age pots until the -10db ± 3db reading is obtained. These pots interact so that when one is adjusted the other is changed.

Dial in 122.000 Mhz and turn on the 1000hz (or 1020 hz) modulation. Adjust the modulation balance pot for symetry of modulation. If Audio Board has been adjusted prior to this, make sure percent of modulation is still correct.

Recheck the R.F. AGC circuit for a -10db ± 3db level across the band. Re-adjust if necessary.

SMO CALIBRATION

There is very little calibration to the S.M.O. Connect a scope to the junction of R206 and R207 (1K's). Adjust L204 and C260 (in the VCO cage) for approximately 50% duty cycle at 122.000MHz.

Dial in 107.000MHz. The S.M.O. should remain locked. Dial in 137.000MHz. The S.M.O. should remain locked.

Rotate all frequency dials through their ranges. The display window should read the same as the dial marking.

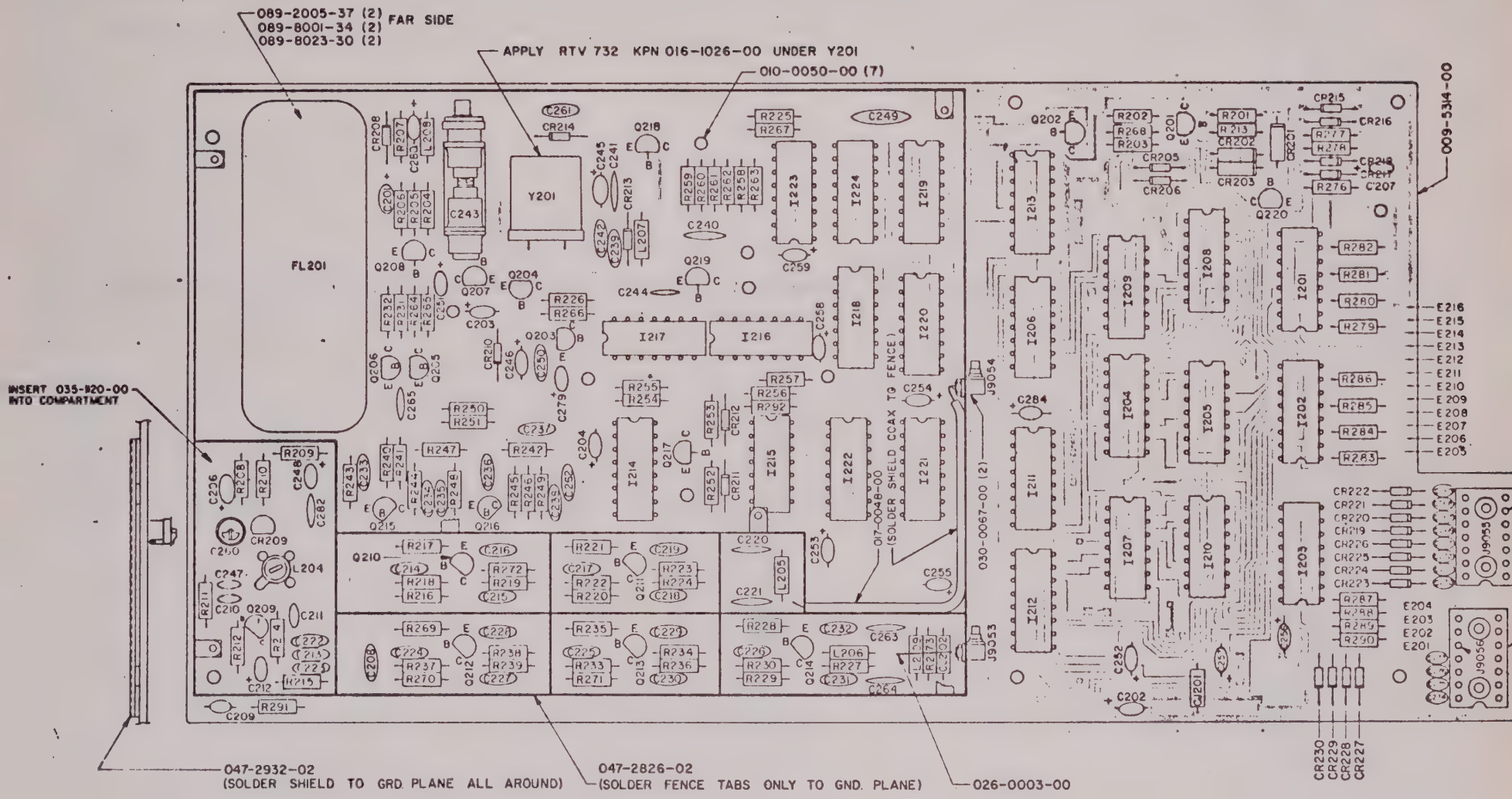


FIGURE 5-3 SYNTHESIZER ASSEMBLY
(Dwg. No. 300-0803-00, R-5)

PARTS LIST REVISION HISTORY				ENGR. APPROVAL
NAME SYNTHESIZER ASSEMBLY				ASS'Y. NO. 200-0597-00
ASS'Y. DWG. 300-0803-00		UNIT KTR 905		USED ON 064-1009-00
REV	CHANGE	SYMBOL	PART NUMBER	DESCRIPTION
9				
10				
				Rev. 0, KTR 905 Maintenance Manual, April, 1974

K-1650 3/73

NAME	ASS'Y. NO.
SYNTHESIZER ASSEMBLY	200-0597-00

KING RADIO CORP. PARTS LISTING

SYMBOL	PART NUMBER	DESCRIPTION	CODE	QUANTITY -00	-01	-02	-03	-04
	009-5314-00	P.C. Board Synthesizer		1				
	~~010-0058-00~~	~~Terminal~~		~~7~~				
	016-1026-00	RTV732		AR				
	017-0048-00	Coax, Rigid		1				
	026-0003-00	Wire, Buss #22		AR				
	035-1120-00	Vibration Suppressor		1				
	~~033-0053-01~~	~~Sockets, I.C.~~		~~2~~				
	047-2826-02	Fence, Syn.	A	1				
	~~047-2931-01~~	~~Shield, Filter~~		~~1~~				
	047-2932-02	Shield, V.C.O.	A	1				
	089-2005-37	Nut #2		2				
	089-8023-30	Flat Washer #2		2				
	089-8001-34	Lock Washer #2		2				
Q201	007-0211-00	TSTR GE5559		4				
Q202	007-0179-00	TSTR 2N3904		3				
Q203	007-0211-00	TSTR GE5559		-				
Q204	007-0211-00	TSTR GE5559		-				
Q205	007-0210-00	TSTR GE1798		3				
Q206	007-0210-00	TSTR GE1798		-				
Q207	007-0210-00	TSTR GE1798		-				
Q208	007-0179-00	TSTR 2N3904		-				
Q209	007-0195-00	TSTR MPSH10		8				
Q210	007-0195-00	TSTR MPSH10		-				
Q211	007-0195-00	TSTR MPSH10		-				
Q212	007-0195-00	TSTR MPSH10		-				
Q213	007-0195-00	TSTR MPSH10		-				
Q214	007-0195-00	TSTR MPSH10		-				
Q215	007-0195-00	TSTR MPSH10		-				
Q216	007-0195-00	TSTR MPSH10		-				
Q217	007-0060-00	TSTR MPS3640		1				
Q218	007-0238-00	TSTR FPN4917		1				
Q219	007-0179-00	TSTR 2N3904		-				
Q220	007-0211-00	TSTR GE5559		-				
CR201	007-6022-00	DIO TS-6		2				
CR202	007-5011-00	DIO Zener, 6.2V		1				
CR203	007-6022-00	DIO TS-6		-				
CR204								
CR205	007-6016-00	DIO 1N4154		24				
CR206	007-6016-00	DIO 1N4154		-				
CR207	~~007-6016-00~~	~~DIO 1N4154~~						
CR208	007-6016-00	DIO 1N4154		-				
CR209	007-4017-00	VCTR MV104		1				
CR210	007-6016-00	DIO 1N4154		-				
CR211	007-6016-00	DIO 1N4154		-				
CR212	007-6016-00	DIO 1N4154		-				
CR213	007-6016-00	DIO 1N4154		-				
CR214	007-6016-00	DIO 1N4154		-				

NAME	ASS'Y. NO.
SYNTHESIZER ASSEMBLY	200-0597-00

KING RADIO CORP. PARTS LISTING

SYMBOL	PART NUMBER	DESCRIPTION	CODE	QUANTITY -00	-01	-02	-03	-04
CR215	007-6016-00	DIO 1N4154		-				
CR216	007-6016-00	DIO 1N4154		-				
CR217	007-6016-00	DIO 1N4154		-				
CR218	007-6016-00	DIO 1N4154		-				
CR219	007-6016-00	DIO 1N4154		-				
CR220	007-6016-00	DIO 1N4154		-				
CR221	007-6016-00	DIO 1N4154		-				
CR222	007-6016-00	DIO 1N4154		-				
CR223	007-6016-00	DIO 1N4154		-				
CR224	007-6016-00	DIO 1N4154		-				
CR225	007-6016-00	DIO 1N4154		-				
CR226	007-6016-00	DIO 1N4154		-				
CR227	007-6016-00	DIO 1N4154		-				
CR228	007-6016-00	DIO 1N4154		-				
CR229	007-6016-00	DIO 1N4154		-				
CR230	007-6016-00	DIO 1N4154		-				
FL201	017-0047-00	Filter 25kHz		1				
L201								
L202								
L203								
L204	019-2204-00	Coil ADJ VCO		1				
L205	019-2084-01	Choke .15uh		2				
L206	019-2084-23	Choke 1.2uh		1				
L207	019-2084-54	Choke 27uh		1				
L208	019-2084-79	Choke 270uh		1				
L209	019-2084-01	Choke .15uh		-				
CJ201	026-0018-00	Circuit Jumper		2				
CJ202	026-0018-00	Circuit Jumper		-				
J9053	030-0067-00	Conn., Coax		2				
J9054	030-0067-00	Conn., Coax		-				
J9055	033-0053-01	Socket, I. C.		2				
J9056	033-0053-01	Socket, I. C.		-				
Y201	044-0053-00	Xtal 3.2MHz		1				
C201	096-1030-35	CAP T 22uf 20V		3				
C202	096-1030-01	CAP T 1.0uf 20V		15				
C203	096-1030-01	CAP T 1.0uf 20V		-				
C204	096-1030-05	CAP T 10uf 20V		2				
C205	~~096-1030-05~~	~~CAP T 10uf 20V~~		-				
C206	096-1030-35	CAP T 22uf 20V		-				
C207	096-1030-29	Cap T .22µf 20V		1				
C208	113-5102-00	CAP D/C .001uf		12				
C209	111-0001-00	CAP M/C .01uf		13				
C210	104-0001-44	CAP M DM 56pf		1				
C211	104-0001-45	CAP M DM 43pf		1				
C212	096-1030-05	CAP T 10uf 20V		-				
C213	113-5101-01	CAP D/C 100pf		17				
C214	113-5102-00	CAP DC .001uf		[illegible]				

NAME	ASS'Y. NO.
SYNTHESIZER ASSEMBLY	200-0597-00

KING RADIO CORP. PARTS LISTING

SYMBOL	PART NUMBER	DESCRIPTION	CODE	QUANTITY -00	-01	-02	-03	-04
C215	113-5101-01	CAP D/C 100pf		-				
C216	113-5101-01	CAP D/C 100pf		-				
C217	113-5102-00	CAP D/C .001uf		-				
C218	113-5101-01	CAP D/C 100pf		-				
C219	113-5101-01	CAP D/C 100pf		-				
C220	104-0001-42	CAP M DM 5pf		2				
C221	104-0001-41	CAP M DM 22pf		2				
C222	113-5101-01	CAP D/C 100pf		-				
C223	113-5101-01	CAP D/C 100pf		-				
C224	113-5102-00	CAP D/C .001uf		-				
C225	113-5102-00	CAP D/C .001uf		-				
C226	113-5102-00	CAP D/C .001uf		-				
C227	113-5101-01	CAP D/C 100pf		-				
C228	113-5101-01	CAP D/C 100pf		-				
C229	113-5101-01	CAP D/C 100pf		-				
C230	113-5101-01	CAP D/C 100pf		-				
C231	113-5101-01	CAP D/C 100pf		-				
C232	113-5101-01	CAP D/C 100pf		-				
C233	113-5102-00	CAP D/C .001uf		-				
C234	113-5101-01	CAP D/C 100pf		-				
C235	113-5101-01	CAP D/C 100pf		-				
C236	113-5102-00	CAP D/C .001uf		-				
C237	113-5101-01	CAP D/C 100pf		-				
C238	113-5101-01	CAP D/C 100pf		-				
C239	113-5102-00	CAP D/C .001uf		-				
C240	104-0001-04	CAP M DM 470pf		2				
C241	104-0001-04	CAP M DM 470pf		-				
C242	118-0021-00	CAP D/C 22pf N750		1				
C243	102-0030-00	CAP Vari 1-16pf		1				
C244	104-0001-14	CAP M DM 33pf		1				
C245	096-1030-35	CAP T 22uf 20V		-				
C246	096-1030-16	CAP T 2.2uf		1				
C247	104-0001-09	CAP M DM 47pf		1				
C248	096-1030-01	CAP T 1.0uf 20V		-				
C249	111-0001-06	CAP M/C .47uf		1				
C250	113-5102-00	CAP D/C .001uf		-				
C251	096-1030-01	CAP T 1.0uf 20V		-				
C252	096-1030-01	CAP T 1.0uf 20V		-				
C253	096-1030-01	CAP T 1.0uf 20V		-				
C254	096-1030-01	CAP T 1.0uf 20V		-				
C255	096-1030-01	CAP T 1.0uf 20V		-				
C256	096-1030-01	CAP T 1.0uf 20V		-				
C257	096-1030-01	CAP T 1.0uf 20V		-				
C258	096-1030-01	CAP T 1.0uf 20V		-				
C259	096-1030-01	CAP T 1.0uf 20V		-				
C260	102-0038-00	CAP Vari 1.1-3.5pf		1				
C261	113-5102-00	CAP D/C .001uf		-				
C262	113-5102-00	CAP D/C .001uf		-				
C263	104-0001-42	CAP M DM 5pf		-				
C264	104-0001-41	CAP M DM 22pf		-				
C265	111-0001-01	CAP M/C 0.1uf		2				
C266	111-0001-00	CAP M/C .01uf		-				
C267	111-0001-00	CAP M/C .01uf		-				
C268	111-0001-00	CAP M/C .01uf		-				

NAME	ASS'Y. NO.
SYNTHESIZER ASSEMBLY	200-0597-00

KING RADIO CORP. PARTS LISTING

SYMBOL	PART NUMBER	DESCRIPTION	CODE	QUANTITY -00	-01	-02	-03	-04
C269	111-0001-00	CAP M/C .01μf		-				
C270	111-0001-00	CAP M/C .01μf		-				
C271	111-0001-00	CAP M/C .01μf		-				
C272	111-0001-00	CAP M/C .01μf		-				
C273	111-0001-00	CAP M/C .01μf		-				
C274	111-0001-00	CAP M/C .01μf		-				
C275	111-0001-00	CAP M/C .01μf		-				
C276	111-0001-00	CAP M/C .01μf		-				
C277	111-0001-00	CAP M/C .01μf		-				
C278	~~113-5471-00~~	~~CAP D/C 470pf~~		~~1~~				
C279	096-1030-01	CAP T 1.0μf 20V		-				
C280	096-1030-01	CAP T 1.0μf 20V		-				
C281	~~096-1080-08~~	~~CAP T .47μf 50V~~		~~1~~				
C282	111-0001-01	CAP M/C .1μf 50V		-				
C283	~~111-0001-03~~	~~CAP M/C .22μf 50V~~		~~1~~				
C284	096-1030-01	CAP T 1.0μf 20V		-				
I201	120-6013-00	I. C. CD4019		3				
I202	120-6013-00	I. C. CD4019		-				
I203	120-6013-00	I. C. CD4019		-				
I204	120-6023-00	I. C. CD4028AE		1				
I205	120-6016-00	I. C. CD4025AE		1				
I206	120-6003-00	I. C. CD4002AE		1				
I207	120-6007-00	I. C. CD4011AE		1				
I208	120-6002-00	I. C. CD4001AE		1				
I209	120-6002-00	I. C. CD4001AE		1				
I210	120-6019-00	I. C. CD4030AE		1				
I211	120-6025-00	I. C. CD4049		1				
I212	120-6026-00	I. C. CD4050		2				
I213	120-6026-00	I. C. CD4050		-				
I214	120-4006-00	I. C. 95H9059		1				
I215	120-0056-01	I. C. MC3162L		1				
I216	120-0059-01	I. C. DM/Sn54L74		1				
I217	120-0058-01	I. C. DM/SN54L00		1				
I218	120-0001-01	I. C. DM/SN5400		1				
I219	120-0050-01	I. C. DM 76L75		3				
I220	120-0050-01	I. C. DM 76L75		-				
I221	120-0050-01	I. C. DM 76L75		-				
I222	120-0050-03	I. C. DM 76L76		3				
I223	120-0050-03	I. C. DM 76L76		-				
I224	120-0050-03	I. C. DM 76L76		-				
R201	130-0392-23	RES F/C 3.9K QW 5%		2				
R202	130-0103-23	RES F/C 10K QW 5%		20				
R203	130-0333-23	RES F/C 33K QW 5%		1				
R204	130-0472-23	RES F/C 4.7K QW 5%		4				
R205	130-0103-23	RES F/C 10K QW 5%		-				
R206	130-0102-23	RES F/C 1K QW 5%		2				
R207	130-0102-23	RES F/C 1K QW 5%		-				
R208	130-0471-23	RES F/C 470 QW 5%		2				

NAME	ASS'Y. NO.
SYNTHESIZER ASSEMBLY	200-0597-00

KING RADIO CORP. PARTS LISTING

SYMBOL	PART NUMBER	DESCRIPTION	CODE	QUANTITY -00	-01	-02	-03	-04
R209	130-0104-23	RES F/C 100K QW 5%		1				
R210	130-0473-23	RES F/C 47K QW 5%		1				
R211	130-0222-23	RES F/C 2.2K QW 5%		8				
R212	130-0123-23	RES F/C 12K QW 5%		8				
R213	130-0202-23	RES F/C 2K QW		1				
R214	130-0471-23	RES F/C 470 QW 5%		-				
R215	130-0560-23	RES F/C 56 QW 5%		1				
R216	130-0123-23	RES F/C 12K QW 5%		-				
R217	130-0222-23	RES F/C 2.2K QW 5%		-				
R218	130-0101-23	RES F/C 100 QW		9				
R219	130-0181-23	RES F/C 180 QW 5%		7				
R220	130-0123-23	RES F/C 12K QW 5%		-				
R221	130-0222-23	RES F/C 2.2K QW 5%		-				
R222	130-0101-23	RES F/C 100 QW		-				
R223	130-0681-23	RES F/C 680 QW 5%		7				
R224	130-0181-23	RES F/C 180 QW 5%		-				
R225	130-0682-23	RES F/C 6.8K QW 5%		2				
R226	130-0103-23	RES F/C 10K QW 5%		-				
R227	130-0181-23	RES F/C 80 QW 5%		-				
R228	130-0222-23	RES F/C 2.2K QW 5%		-				
R229	130-0123-23	RES F/C 12K QW 5%		-				
R230	130-0101-23	RES F/C 100 QW 5%		-				
R231	130-0103-23	RES F/C 10K QW 5%		-				
R232	130-0103-23	RES F/C 10K QW 5%		-				
R233	130-0101-23	RES F/C 100 QW 5%		-				
R234	130-0681-23	RES F/C 680 QW 5%		-				
R235	130-0222-23	RES F/C 2.2K QW 5%		-				
R236	130-0181-23	RES F/C 180 QW 5%		-				
R237	130-0101-23	RES F/C 100 QW 5%		-				
R238	130-0681-23	RES F/C 680 QW 5%		-				
R239	130-0181-23	RES F/C 180 QW 5%		-				
R240	130-0123-23	RES F/C 12K QW 5%		-				
R241	130-0222-23	RES F/C 2.2K QW 5%		-				
R242	130-0101-23	RES F/C 100 QW 5%		-				
R243	130-0681-23	RES F/C 680 QW 5%		-				
R244	130-0181-23	RES F/C 180 QW 5%		-				
R245	130-0123-23	RES F/C 12K QW 5%		-				
R246	130-0222-23	RES F/C 2.2K QW 5%		-				
R247	130-0101-23	RES F/C 100 QW 5%		-				
R248	130-0681-23	RES F/C 680 QW 5%		-				
R249	130-0181-23	RES F/C 180 QW 5%		-				
R250	130-0271-23	RES F/C 270 QW 5%		1				
R251	130-0821-23	RES F/C 820 QW 5%		1				
R252	130-0182-23	RES F/C 1.8K QW 5%		1				
R253	130-0221-23	RES F/C 220 QW 5%		1				
R254	130-0241-23	RES F/C 240 QW 5%		2				
R255	130-0241-23	RES F/C 240 QW 5%		-				
R256	130-0271-23	RES F/C 270 QW 5%		2				

NAME	ASS'Y. NO.
SYNTHESIZER ASSEMBLY	200-0597-00

KING RADIO CORP. PARTS LISTING

SYMBOL	PART NUMBER	DESCRIPTION	CODE	QUANTITY -00	-01	-02	-03	-04
R257	130-0271-23	RES F/C 270 QW 5%		-				
R258	130-0392-23	RES F/C 3.9K QW 5%		-				
R259	130-0682-23	RES F/C 6.8K QW 5%		-				
R260	130-0751-23	RES F/C 750 QW 5%		1				
R261	130-0822-23	RES F/C 8.2K QW 5%		1				
R262	130-0122-23	RES F/C 1.2K QW 5%		1				
R263	130-0681-23	RES F/C 680 QW 5%		-				
R264	130-0472-23	RES F/C 4.7K QW 5%		-				
R265	130-0472-23	RES F/C 4.7K QW 5%		-				
R266	130-0272-23	RES F/C 2.7K QW 5%		1				
R267	130-0472-23	RES F/C 4.7K QW 5%		-				
R268	130-0223-23	RES F/C 22K QW 5%		1				
R269	130-0222-23	RES F/C 2.2K QW 5%		-				
R270	130-0123-23	RES F/C 12K QW 5%		-				
R271	130-0123-23	RES F/C 12K QW 5%		-				
R272	130-0681-23	RES F/C 680 QW 5%		-				
~~R273~~	~~130-0151-23~~	~~RES F/C 150 QW 5%~~		~~2~~				
~~R274~~	~~130-0151-23~~	~~RES F/C 150 QW 5%~~		-				
~~R275~~	~~130-0360-23~~	~~RES F/C 36 QW5%~~		~~1~~				
R276	130-0103-23	RES F/C 10K QW 5%		-				
R277	130-0103-23	RES F/C 10K QW 5%		-				
R278	130-0103-23	RES F/C 10K QW 5%		-				
R279	130-0103-23	RES F/C 10K QW 5%		-				
R280	130-0103-23	RES F/C 10K QW 5%		-				
R281	130-0103-23	RES F/C 10K QW 5%		-				
R282	130-0103-23	RES F/C 10K QW 5%		-				
R283	130-0103-23	RES F/C 10K QW 5%		-				
R284	130-0103-23	RES F/C 10K QW 5%		-				
R285	130-0103-23	RES F/C 10K QW 5%		-				
R286	130-0103-23	RES F/C 10K QW 5%		-				
R287	130-0103-23	RES F/C 10K QW 5%		-				
R288	130-0103-23	RES F/C 10K QW 5%		-				
R289	130-0103-23	RES F/C 10K QW 5%		-				
R290	130-0103-23	RES F/C 10K QW 5%		-				
R291	130-0101-23	RES F/C 100 QW 5%		-				
R292	130-0101-23	RES F/C 100 QW 5%		-				
TP201	010-0050-00	Terminal		7				
TP202	010-0050-00	Terminal		-				
TP203	010-0050-00	Terminal		-				
TP204	010-0050-00	Terminal		-				
TP205	010-0050-00	Terminal		-				
TP206	010-0050-00	Terminal		-				
TP207	010-0050-00	Terminal		-				
R273	130-0200-23	RES F/C 20 QW 5%		1				

SHT 9 OF 9

I-201 13 1DA
12 10B
11 1mA
10 1mB
I202 13 1mC
12 1mD
11 .1mA
10 .1B
I203 13 .1C
12 .1D
11 .01A
10 .01B

E220 to [illegible]

I-211 E-217 to I-211 pin 14
pin 15 to I-218
E219 to I-222 pin 4

10A 10B 1A 1B 1C 1D
.01B 1 .01B .01A .1D .1C .1B .1A

.1A .1B .1C .1D .01A .01B
1D 1C 1B 1A 10B 10A

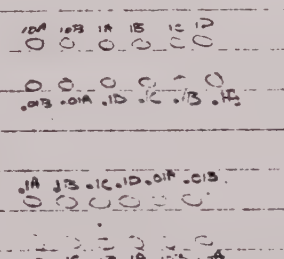


TABLE 6-2

FREQUENCY INCREMENT		PIN NUMBER A	B	C	D
		I201/1, 15*	I201/3, 2*		
10MHz	1	1	0		
	2	0	1		
	3	1	1		
		I201/5, 4* I202/5, 4*	I201/7, 6* I202/7, 6*	I202/1, 15* I203/1, 15*	I202/3, 2* I203/3, 2*
1MHz & 100MHz	0	0	0	0	0
	1	1	0	0	0
	2	0	1	0	0
	3	1	1	0	0
	4	0	0	1	0
	5	1	0	1	0
	6	0	1	1	0
	7	1	1	1	0
	8	0	0	0	1
	9	1	0	0	1
		I203/5, 4*	I203/7. 6*		
10KHz	0	0	0		
	2	0	1		
	5	1	0		
	7	1	1		

*Indicates levels from serial logic outputs.

TABLE 6-2 CHANNELING LOGIC INPUT LEVELS

	I-222				I221				I220				I-219			
PIN #	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6
FREQUENCY MHz	10MHz A	B	C	D	1MHz A	B	C	D	KHz 1 A	B	C	D	KHz 2 A	B	C	D	FREQUENCY KHz
118	0	0	1	0	1	0	0	0	1	0	0	1	1	0	0	1	000
119	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	025
120	1	1	0	0	1	0	0	1	1	0	0	1	1	1	1	0	050
121	1	1	0	0	0	0	0	1	1	0	0	1	0	1	1	0	075
122	1	1	0	0	1	1	1	0	1	0	0	1	1	0	1	0	100
123	1	1	0	0	0	1	1	0	1	0	0	1	0	0	1	0	125
124	1	1	0	0	1	0	1	0	1	0	0	1	1	1	0	0	150
125	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	0	175
126	1	1	0	0	1	1	0	0	1	0	0	1	1	0	0	0	200
127	1	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	225
128	1	1	0	0	1	0	0	0	0	0	0	1	1	0	0	1	250
129	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	275
130	0	1	0	0	1	0	0	1	0	0	0	1	1	1	1	0	300
131	0	1	0	0	0	0	0	1	0	0	0	1	0	1	1	0	325
132	0	1	0	0	1	1	1	0	0	0	0	1	1	0	1	0	350
133	0	1	0	0	0	1	1	0	0	0	0	1	0	0	1	0	375
134	0	1	0	0	1	0	1	0	0	0	0	1	1	1	0	0	400
135	0	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0	425
136	0	1	0	0	1	1	0	0	0	0	0	1	1	0	0	0	450
137	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	475
138	0	1	0	0	1	0	0	0	1	1	1	0	1	0	0	1	500
139	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0	1	525
140	1	0	0	0	1	0	0	1	1	1	1	0	1	1	1	0	550
141	1	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0	575
142	1	0	0	0	1	1	1	0	1	1	1	0	1	0	1	0	600
143	1	0	0	0	0	1	1	0	1	1	1	0	0	0	1	0	625
144	1	0	0	0	1	0	1	0	1	1	1	0	1	1	0	0	650
145	1	0	0	0	0	0	1	0	1	1	1	0	0	1	0	0	675
									1	1	1	0	1	0	0	0	700
									1	1	1	0	0	0	0	0	725
									0	1	1	0	1	0	0	1	750
									0	1	1	0	0	0	0	1	775
									0	1	1	0	1	1	1	0	800
									0	1	1	0	0	1	1	0	825
									0	1	1	0	1	0	1	0	850
									0	1	1	0	0	0	1	0	875
									0	1	1	0	1	1	0	0	900
									0	1	1	0	0	1	0	0	925
									0	1	1	0	1	0	0	0	950
									0	1	1	0	0	0	0	0	975

TABLE 6-3 CHANNELING LOGIC OUTPUT LEVELS

AUDIO GENERATOR

The Audio Generator board contains a regulated power supply, variable frequency oscillator, and a variable gain amplifier. The output level and frequency are controlled by C/Mos Bilateral Switches (CD 4016). The gates of the bilateral switches are controlled by the pushbutton panel switch-bank labeled "modulation frequency". When one of the "Modulation frequency" switches is closed, two bilateral switches are enabled, one selecting frequency and another setting level. Pots are provided for each frequency and each level adjustment.

All connections to this board are through an I.C. socket used as a connector.

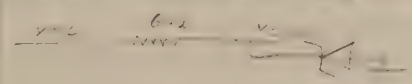
1. 108 — 35 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]



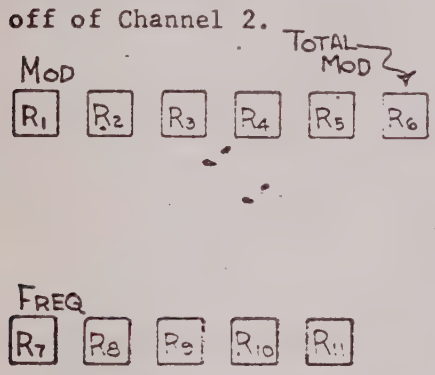
[illegible]

6.

Misc Info

~~[illegible] CALIBRATION~~

One edge of the audio board has 5 variable pots, the other side has 6 variable pots. Using a 475 Tektronic with Channel 2 vertical signal output, connect a frequency counter (5382A HP) to this output. Set switch of frequency counter to 1sKHz and x1 input. Connect Channel 2 of scope to coupling cap on SMO board (right rear corner). Set scope to .1v/Div. & .5ms Time/Div. On the right rear of panel is an N type connector output. Connect this output to Channel 1 of the scope. Channel 1 will be used to look at the modulated carrier and Channel 2 will be used to look at the audio and count its frequency. Sync off of Channel 2.



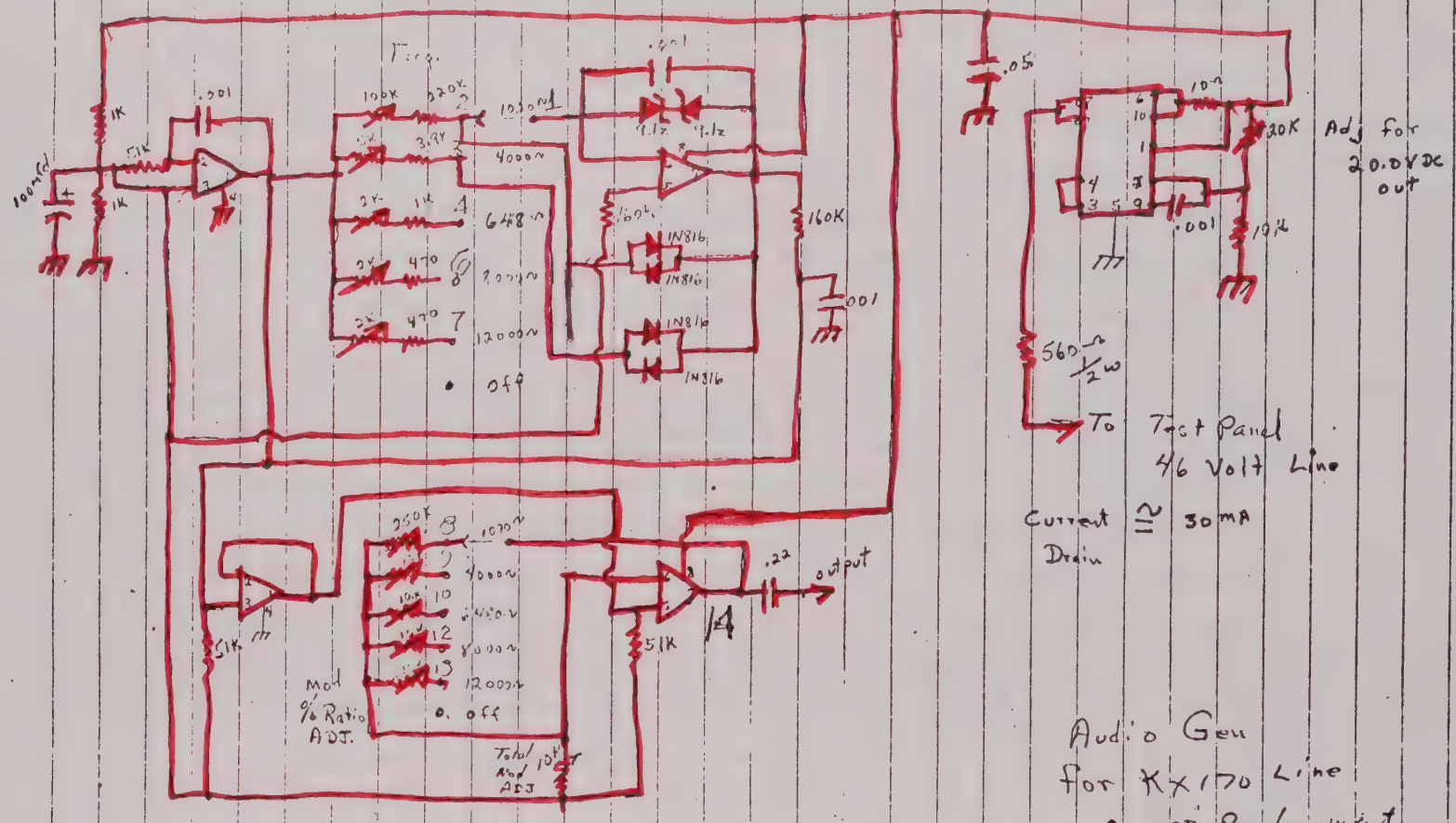
	FREQ	FREQ	MOD	
S_1	4K	R_{10}	R_1	60%
S_2	1020	R_{11}	R_2	30%
S_3	6.8K	R_7	R_3	60%
S_4	8K	R_8	R_4	80%
S_5	12K	R_9	R_5	80%

Push Mod ON switch IN. Push Modulation frequency switch 1 IN. R10 and R1 control this function. Switch 2 is controlled by R11 and R2. Switch 3 is controlled by R7 and R3. Switch 4 is controlled by R8 and R4. Switch 5 is controlled by R9 and R5. R6 is total mod adjust pot.

On the terminal board is a pot used to adjust overall modulation out. Generally this pot is used to get modulation of 1000Hz to 30% modulation because of the low input needed by the modulation and because it is the lowest percent of modulation needed.

Adjust frequency and modulation per needs of unit being tested (example for the KX 170B - Switch 1 is 4KHz 60%, switch 2 is 1020Hz 30% Mod., Switch 3 is 6.48KHz 60% mod, Switch 4 is 8KHz 80% Mod, Switch 5 is 12KHz 80% Mod.)

For Example: To set 1020Hz push switch 2, adjust R11 until 1020 Hz is observed on frequency counter. Next, adjust R2 for desired modulation (30%). Modulation is determined by switching to Channel 1 and observing the modulation. Modulation is figured by $\frac{P-V}{P+V} \times 100 = \%$ of modulation. P is Peak to Peak of signal and V is Valley to Valley of modulation. Count the divisions of Peak to Peak signal on the scope and count the Valley to Valley devisions on the scope and apply them to the formula. If 30% modulation cannot be achieved adjust pot on TERMINAL BOARD and TOTAL MODULATION POT. Then adjust the other frequencies and modulations. DO NOT ADJUST TOTAL MOD AND POT ON TERMINAL BOARD or 1020Hz modulation will have to be readjusted and refigured so this is the lowest needed modulation required. The other modulation of the other frequencies should be able to be taken care of by their own modulation pots. NOTE: IT IS BETTER TO ROUGH IN ALL FREQUENCIES AND MODULATION BEFORE FINAL FREQUENCY AND MODULATION ADJUSTMENTS ARE MADE.



PIN 5- SUPPLY VOLTAGE
PIN 11- GROUND

BILL OF MATERIAL

: PANO CORPORATION. OLATHE KANSAS 66061

ASS'Y NAME: Audio Generator

UNIT TYPE: RF Generator

NUMBER

SHT OF

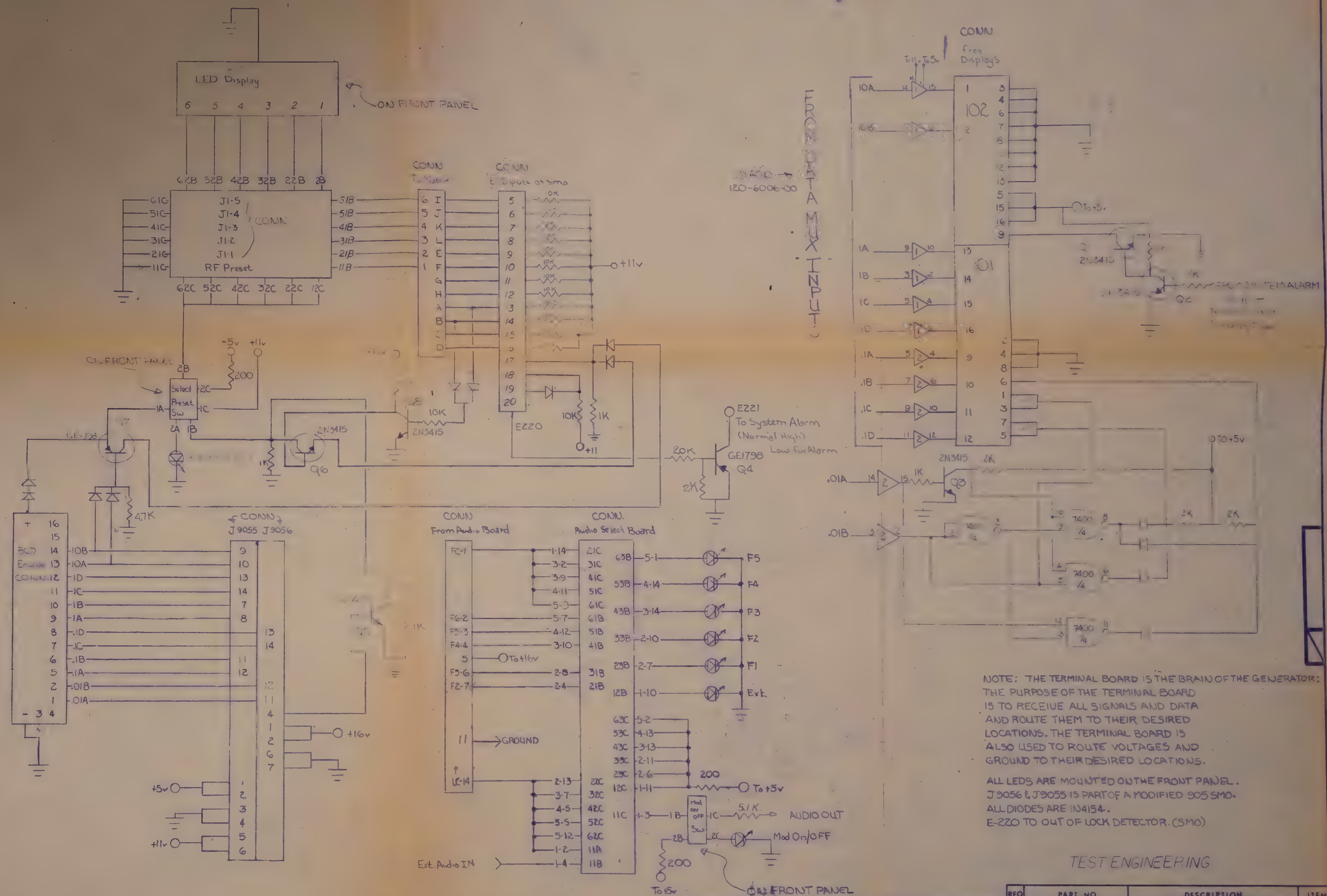
ASS'Y DWG NO

D ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

M	PART NUMBER	DESCRIPTION	PT. NO U/M					
	007-5011-16	9.1v Zener		2				
	007-6035-00	1N816 Diode		4				
	033-0053-01	14 pin IC Socket		2				
	033-0053-02	16 pin IC Socket		1				
	096-1030-00	1uf 35v Tantalum		1				
	096-5004-04	100uf 15v Tantalum		1				
	105-0018-14	.001uf 200v Mylar Cap		3				
	113-5102-00	.001uf Cap Disc		1				
	120-3022-00	LM1458 OP AMP		2				
	120-3023-01	LM723 Voltage Regulator		1				
	130-0011-23	10Ω Resistor QW 5%		2				
	130-0471-23	470Ω Resistor QW 5%		2				
	130-0102-23	1KΩ Resistor QW 5%		2				
	130-0392-23	3.9KΩ Resistor QW 5%		1				
	130-0103-23	10KΩ Resistor QW 5%		2				
	130-0513-23	51KΩ Resistor QW 5%		3				
	130-0164-23	160KΩ Resistor QW 5%		1				
	133-0051-05	2K Pot 10 Turn		3				
	133-0051-06	5K Pot 10 Turn		1				
	133-0051-07	10K Pot 10 Turn		5				
	133-0079-08	100K Pot 10 Turn		1				
	133-0079-10	250K Pot 10 Turn		1				

220 A 3/67

SEE LAST SHT FOR REVISION



NOTE: THE TERMINAL BOARD IS THE BRAIN OF THE GENERATOR: THE PURPOSE OF THE TERMINAL BOARD IS TO RECEIVE ALL SIGNALS AND DATA AND ROUTE THEM TO THEIR DESIRED LOCATIONS. THE TERMINAL BOARD IS ALSO USED TO ROUTE VOLTAGES AND GROUND TO THEIR DESIRED LOCATIONS.

ALL LEDS ARE MOUNTED ON THE FRONT PANEL.
J9056 & J9055 IS PART OF A MODIFIED 905 SMO.
ALL DIODES ARE IN4154.
E-220 TO OUT OF LOCK DETECTOR. (SMO)

TEST ENGINEERING

REQ	PART NO	DESCRIPTION	ITEM

SCALE

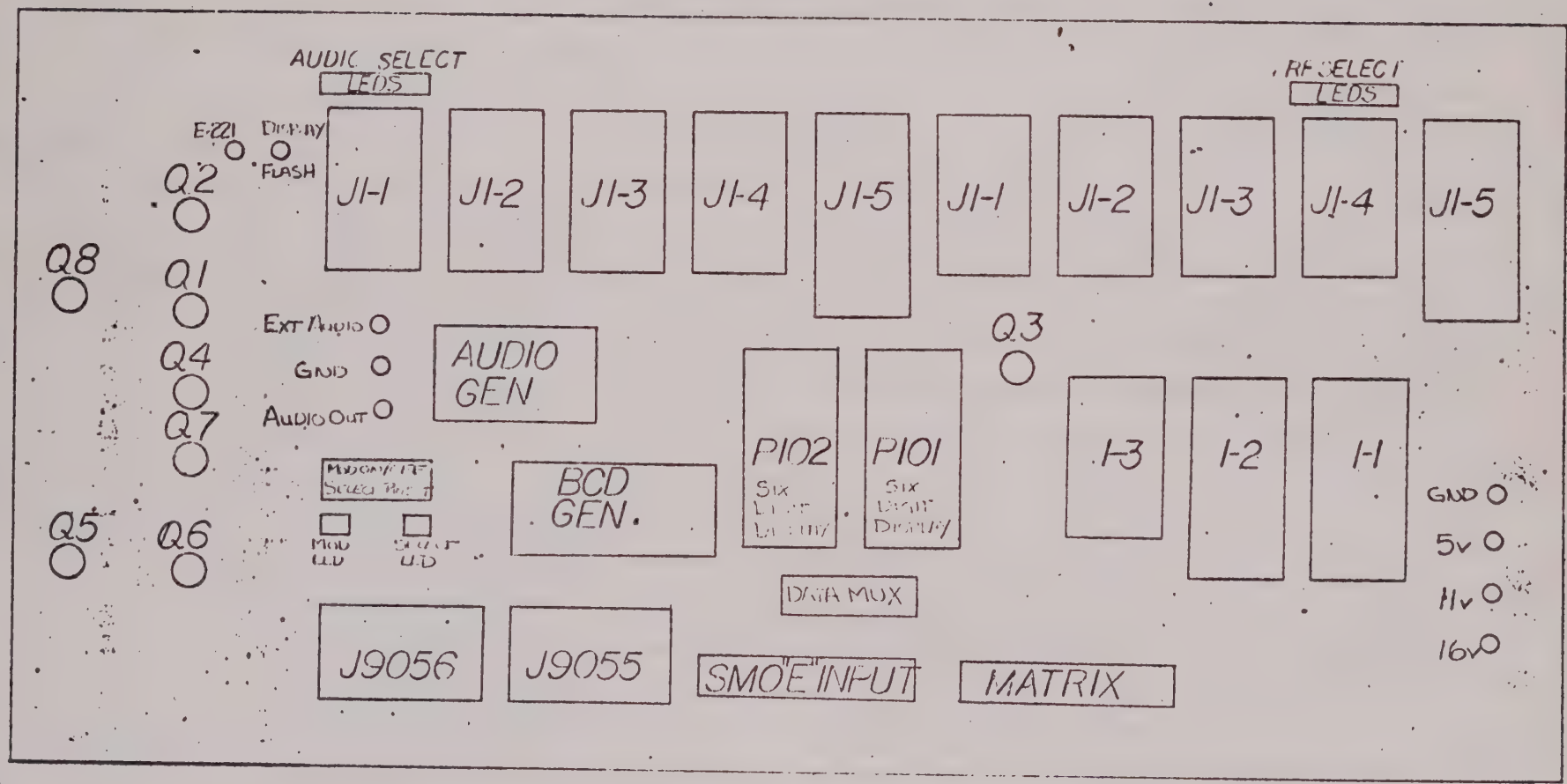
KING RADIO CORPORATION
OLATHE KANSAS 66061

NAME RF TERMINAL BOARD

ELEC ENG | TOL UNLESS NOTED | MAT'L
MECH ENG
DRN | DATE | NUMBER | SHT
CHK | DATE | OF

REV | C.O. NO | DATE | BY

K-1221



Test Engineering

REQ	PART NO	DESCRIPTION	ITE

SCALE

KING RADIO CORPORATION

OLATH KANSA 6606

NAME Terminal Bd. Pictorial

ELEC ENG | TOL UNLESS NOTED | MAT'L

MECH ENG

DRN | DATE | NUMBER | SHT

CHK | DATE | OF

REV	E.C.O. NO	DATE	BY

BILL OF MATERIAL

PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME RF TERMINAL BOARD	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT NO

A	PART NUMBER	DESCRIPTION	U/M					
	001-0078-00	2N3415 NPN TRANSISTOR		6				
	001-0210-00	GE1798 PNP TRANSISTOR		2				
	007-6016-00	1N4154 DIODE		13				
	010-0034-20	TIE POINTS		7				
	030-2219-02	12 PIN CONNECTOR						
	030-2219-04	20 PIN CONNECTOR						
	033-0046-00	TRANSISTOR SOCKET		8				
	033-0053-01	14 PIN IC SOCKET		12				
	033-0053-02	16 PIN IC SOCKET		7				
	120-0001-00	7400 IC		1				
	120-6006-00	CD4010 IC		2				
	130-0201-23	200Ω RESISTOR QW		3				
	130-0102-23	1KΩ RESISTOR QW		4				
	130-0202-23	2KΩ RESISTOR QW		7				
	130-0472-23	4.7KΩ RESISTOR QW		1				
	130-0103-23	10KΩ RESISTOR QW		14				
	130-0153-23	15KΩ RESISTOR QW		1				
	130-0203-23	20KΩ RESISTOR QW		1				

MODULATOR CALIBRATION

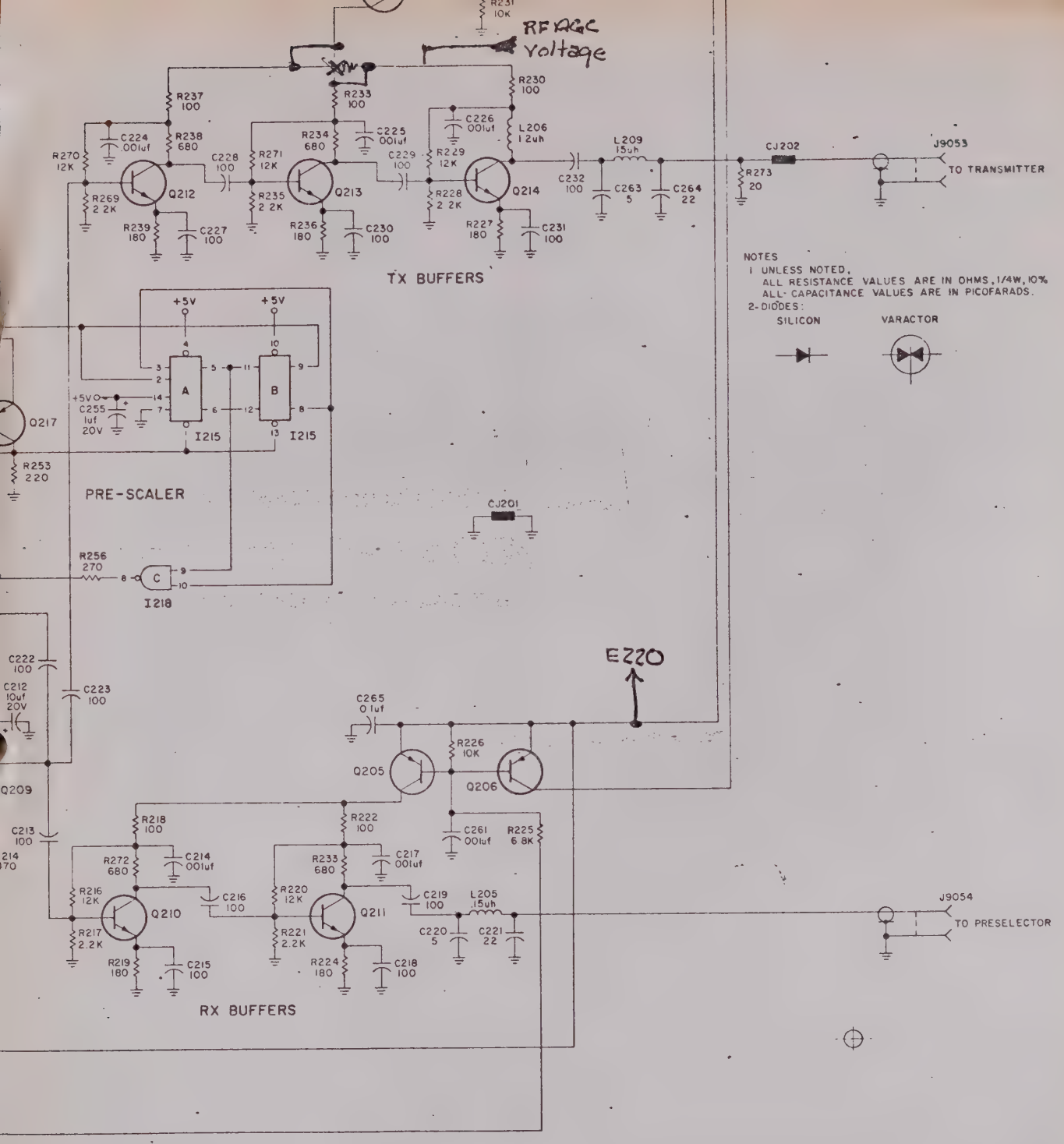
Switch modulation off. Connect RF Power meter (HP 435A) to output of generator. Adjust the RF AGC pot fully CCW. It has been found that this pot has little effect and will probably be removed or replaced with a fixed resistor in later models. Adjust the Mod Bal Pot for .33 ± .02VDC across the 1K 1% resistor in the modulator.

Adjust the RF level pot fully CCW. Dial in 139.975 MHz and adjust the variable cap in the RF level section for maximum output. Dial in 122.000MHz.

Adjust both variable caps in the modulator for an even level (±2db) across the band. By using the preset switches for both ends of the band and the select at 122.000MHz for the center, this is possible. After the level is within limits, check and reset if necessary, the voltage across the 1K 1% resistor (.33 ± .02VDC). Recheck leveling.

Set the RF level pot for a -30db level at 122.000Mhz. Leveling may have changed after this adjustment.

Apply modulation (1020Hz). Calculate the percent of modulation. Adjust each level pot on the audio board to the desired percentage for each frequency.



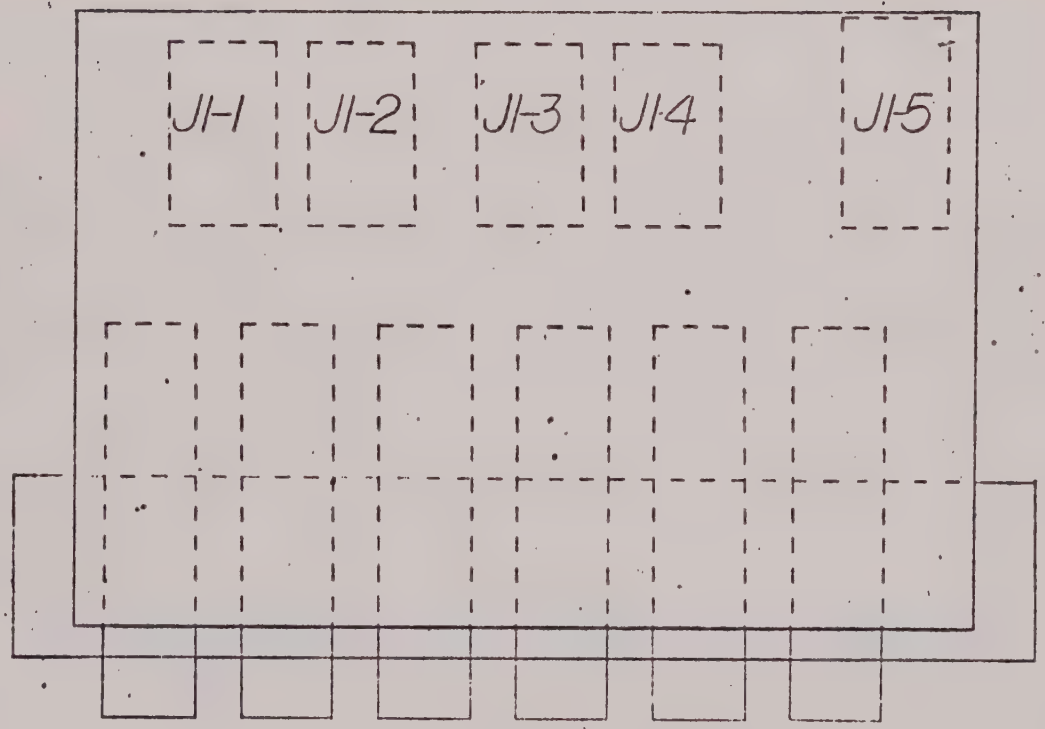
PRINTING INSTRUCTIONS
DO NOT PRINT THIS FORM IN MANUAL
FIG NO 6-32B
PAGE NO 6-83
% of ORIG SIZE 48
SPECIAL INSTRUCTIONS:

K-1498 3-71

KING RADIO CORPORATION

KTR-905 SYNTHESIZER SCHEMATIC

CCG 12/12/72 002-0318-04 2 2



REV	C.O. NO	DATE	BY

REQ	PART NO	DESCRIPTION	ITEM

SCALE

KING RADIO CORPORATION

OLATHE KANSAS 66061

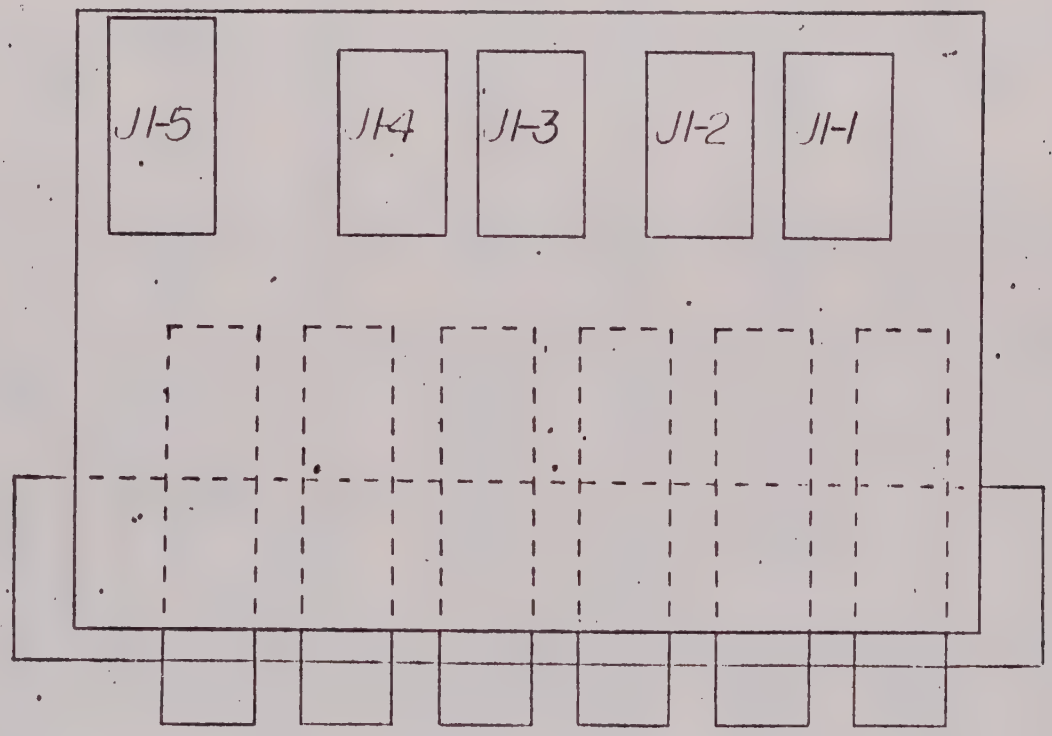
NAME AUDIO PRESET

ELEC ENG | TOL UNLESS NOTED | MAT'L

MECH ENG

DRN | DATE | NUMBER | SHT

CHK | DATE | OF



REV	I.C.O. NO	DATE	BY

REQ	PART NO	DESCRIPTION	ITEM

SCALE

KING RADIO CORPORATION

OLATHE KANSAS 66061

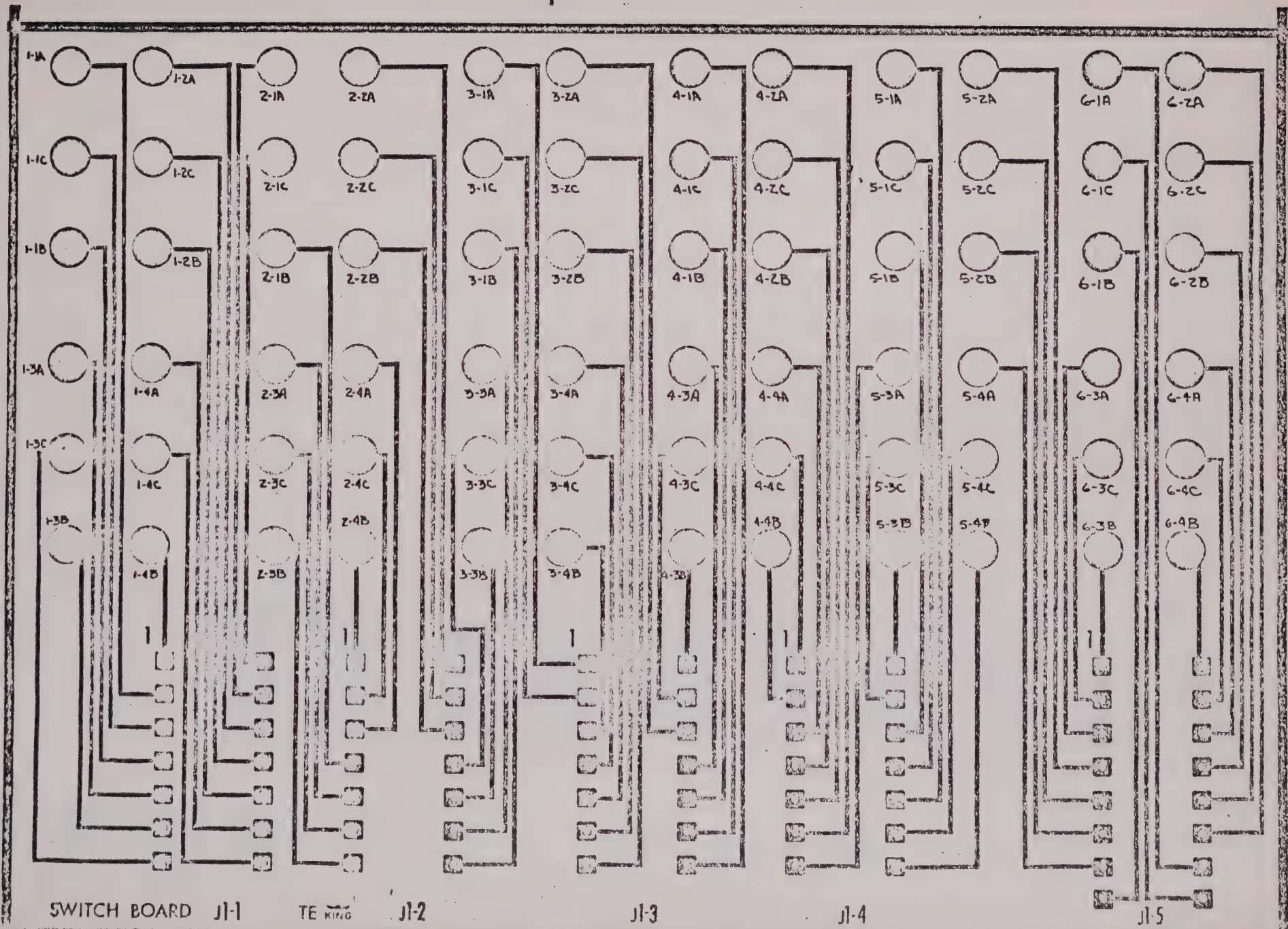
NAME IF FREQ PRESET

ELEC ENG | TOL UNLESS NOTED | MAT'L

MECH ENG

DRN | DATE | NUMBER | SHT

CHK | DATE | OF


1-1A
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6-2A
1-1C
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4-4B
5-3B
5-4B
6-3B
6-4B
1
1
1
1
1
SWITCH BOARD
J1-1
TE RING
J1-2
J1-3
J1-4
J1-5

1-1A	J1-1-2	1-2A	J1-1-12	2-1A	J1-1-13	2-2A	J1-2-14	3-1A	J1-3-1	3-2A	J1-3-12	4-1A	J1-3-8	4-2A	J1-4-6	5-1A	J1-4-10	5-2A	J1-5-4	6-1A	J1-5-10	6-2A	J1-5-11
1-1C	J1-1-3	1-2C	J1-1-11	2-1C	J1-1-14	2-2C	J1-2-13	3-1C	J1-3-2	3-2C	J1-3-7	4-1C	J1-3-9	4-2C	J1-4-5	5-1C	J1-4-11	5-2C	J1-5-5	6-1C	J1-5-9	6-2C	J1-5-12
1-1B	J1-1-4	1-2B	J1-1-10	2-1B	J1-2-4	2-2B	J1-2-12	3-1B	J1-2-8	3-2B	J1-3-6	4-1B	J1-3-10	4-2B	J1-4-4	5-1B	J1-4-12	5-2B	J1-5-6	6-1B	J1-5-8	6-2B	J1-5-13
1-3A	J1-1-5	1-4A	J1-1-9	2-3A	J1-2-5	2-4A	J1-2-3	3-3A	J1-2-9	3-4A	J1-3-5	4-3A	J1-3-11	4-4A	J1-4-3	5-3A	J1-4-7	5-4A	J1-5-7	6-3A	J1-5-3	6-4A	J1-5-14
1-3C	J1-1-7	1-4C	J1-1-8	2-3C	J1-2-6	2-4C	J1-2-2	3-3C	J1-2-11	3-4C	J1-3-4	4-3C	J1-3-13	4-4C	J1-4-1	5-3C	J1-4-13	5-4C	J1-4-9	6-3C	J1-5-2	6-4C	J1-5-15
1-3B	J1-1-6	1-4B	J1-1-1	2-3B	J1-2-7	2-4B	J1-2-1	3-3B	J1-2-10	3-4B	J1-3-3	4-3B	J1-3-14	4-4B	J1-4-2	5-3B	J1-4-14	5-4B	J1-4-8	6-3B	J1-5-1	6-4B	J1-5-16

Test Engineering

REQ	PART NO	DESCRIPTION
SCALE		KING RADIO CORPO
NAME	SWITCHBOARD	

DATE BY

BILL OF MATERIAL

PAINO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME RF PRESET SWITCH BOARD	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT. NO

PART NUMBER	DESCRIPTION	U/M					
033-0053-01	14pin IC Socket		4				
033-0053-02	16pin IC Socket		1				
OUTSIDE PURCHASE	2PDT 6 circuit Interlocked Pushbutton		1				

SEE LAST SHT FOR REVISION

BILL OF MATERIAL

PANO CORPORATION. OLATHE KANSAS 66061

ASS'Y NAME Audio Freq Switch Board

UNIT TYPE REGENERATOR

NUMBER

SHT OF

ASS'Y DWG NO

ON ASS'Y | COMPILED | DATE | CHECKED | DATE | PROJ. ENGR.

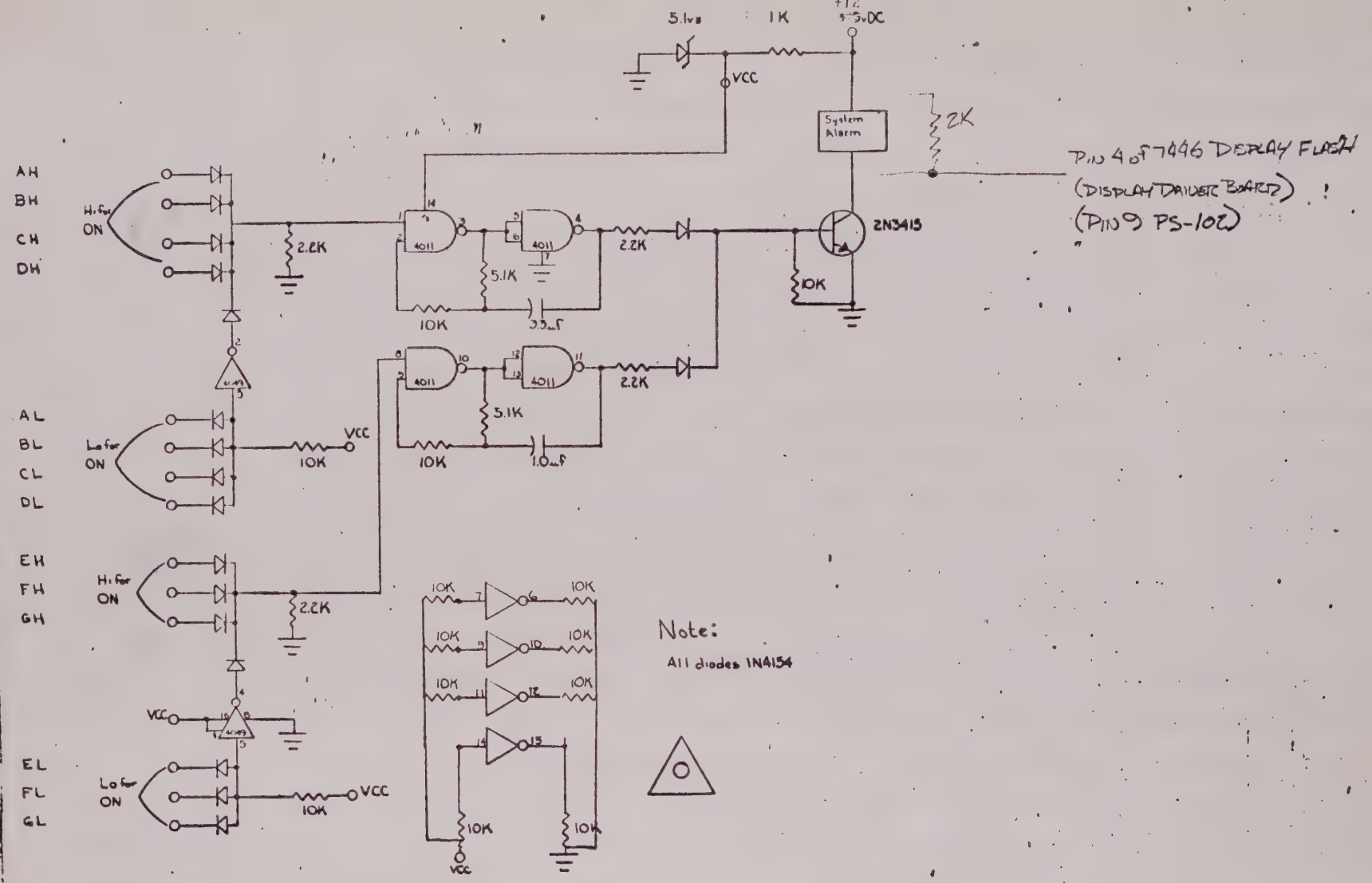
M	PART NUMBER	DESCRIPTION	P.T. NO / U/M					
	033-0053-01	14 pin IC Socket						
	033-0053-02	16 pin IC Socket						
	OUTSIDE PURCHASE	4PDT Gang w/ Interlocked Push Button						

ALARM BOARD

The alarm board has "7 low for alarm" and "7 high for alarm inputs". We use only the 7 low and 1 of the highs. The Sensor board outputs connect to AL thru FL with AL being 5 volts low, BL 5 volts high, etc. GL input is from the out-of-lock detector in the S.M.O. The high input is AH from the high reg. temp. heatsink switch.

If any of the 7 low inputs goes low or the 1 high goes high, then an oscillator is enabled driving an output transistor. This transistor (2N3415) has a 1K collector load resistor. Output is taken from the collector to the display blanking input of the Display Driver board. When display blanking is low, the display is off.

The display flashes approximately 1 PPS during a system failure.



System Alarm Board

BILL OF MATERIAL

PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME System Status Alarm Board	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

D ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

ITM	PART NUMBER	DESCRIPTION	PT NO U/M					
	007-0078-00	2N3415 NPN TRANSISTOR		1				
	007-5030-00	1N4733 5.1v ZENER		1				
	007-6016-00	1N4154 DIODE		18				
	033-0046-00	TRANSISTOR SOCKET		1				
	033-0053-01	14 PIN IC SOCKET		1				
	033-0053-02	16 PIN IC SOCKET		1				
	096-1030-00	1uf TANTALUM CAPACITOR		1				
	096-1030-12	3.3uf TANTALUM CAPACITOR		1				
	120-6007-00	CD4011 IC		1				
	120-6025-00	CD4049 IC		1				
	130-0222-23	2.2K RESISTOR QW		4				
	130-0512-23	5.1K RESISTOR QW		2				
	130-0682-23	6.8K RESISTOR QW		1				
	130-0103-23	10K RESISTOR QW		13				

MODULATOR CALIBRATION

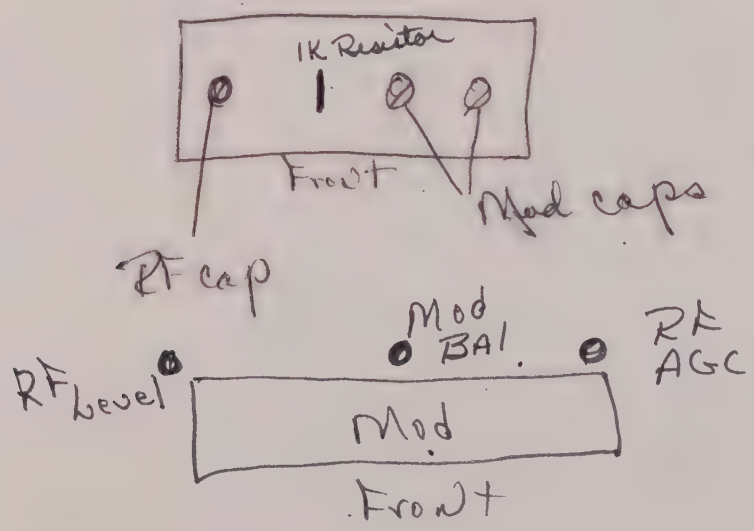
Switch modulation off. Connect RF Power meter (HP 435A) to output of generator. Adjust the RF AGC pot fully CCW. It has been found that this pot has little effect and will probably be removed or replaced with a fixed resistor in later models. Adjust the Mod Bal Pot for .33 ± .02VDC across the 1K 1% resistor in the modulator.

Adjust the RF level pot fully CCW. Dial in 139.975 MHz and adjust the variable cap in the RF level section for maximum output. Dial in 122.000MHz.

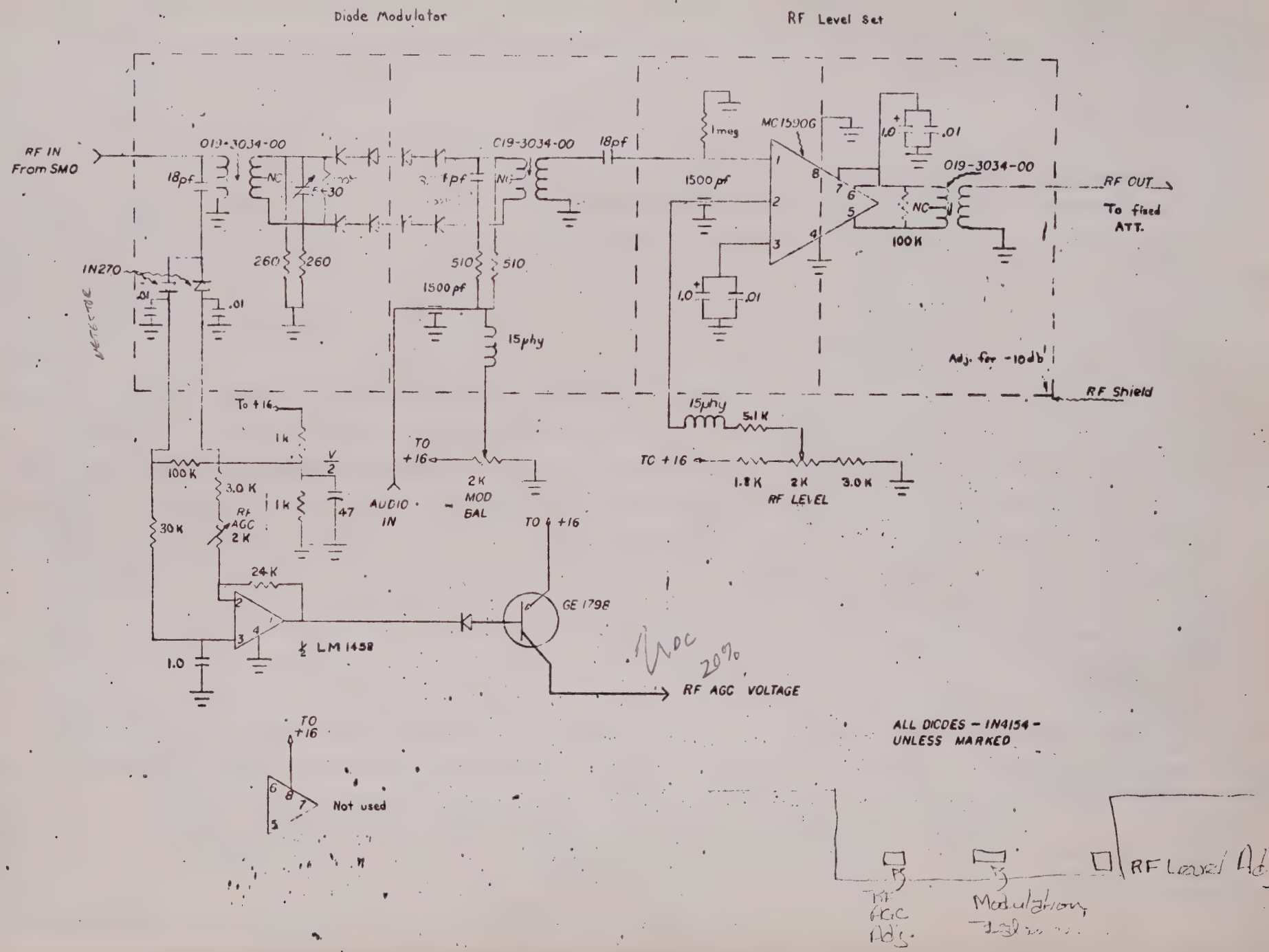
Adjust both variable caps in the modulator for an even level (±2db) across the band. By using the preset switches for both ends of the band and the select at 122.000MHz for the center, this is possible. After the level is within limits, check and reset if necessary, the voltage across the 1K 1% resistor (.33 ± .02VDC). Recheck leveling.

Set the RF level pot for a -20db level at 122.000Mhz. Leveling may have changed after this adjustment.

Apply modulation (1020Hz). Calculate the percent of modulation. Adjust each level pot on the audio board to the desired percentage for each frequency.



Set freq to 108.00 + peak middle cap. The two outside caps may be peaked at 135.975.



Diode Modulator
RF Level Set
RF IN
From SMO
019-3034-00
18pf
NC
260
260
1N270
.01
.01
C19-3034-00
18pf
510
510
1500 pf
15μhy
1meg
MC1590G
1500 pf
1.0
.01
1.0
.01
019-3034-00
NC
100K
RF OUT
To fixed ATT.
Adj. for -10db
RF Shield
15μhy
5.1K
TO +16
1.8K
2K
3.0K
RF LEVEL
To +16
1k
V/2
100K
3.0K
1k
47
30K
RF AGC 2K
24K
1.0
½ LM 1458
TO +16
2K MOD BAL
AUDIO IN
TO +16
GE 1798
RF AGC VOLTAGE
20%
TO +16
Not used
ALL DIODES - 1N4154 - UNLESS MARKED
RF AGC Adj.
Modulation
RF Level Ad

X 34E 1798
XX 36E 1798
007-0210-00

BILL OF MATERIAL

RADIO CORPORATION OLATHE KANSAS 66061	ASS'Y NAME Modulator	NUMBER	SHT 1 OF 2
	UNIT TYPE R.F. Generator	ASS'Y DWG. NO	

BASED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

ITEM	PART NUMBER	DESCRIPTION	PT NO / U/M					
	007-6016-00	1N4154		8				
	007-6035-00	IN270		2				
	019-2054-06	.15uh Choke		2				
	019-3034-00	Toroid		3				
	047-2640-01	Fence		1				
	047-2643-01	Cover		1				
	089-6293-04	Screw #3-48 x 1/4		2				
	096-1030-02	1uf 35v Tant		3				
	096-1030-28	47uf 20v Tant		1				
	102-0031-00	5-30 Var Cap		1				
	106-0034-00	Feedthru 105Kpf		2				
	111-0001-00	103 Blue Cap		4				
	113-3082-00	8.2 pf Cap		1				
	113-3180-00	18 pf Cap		2				
	120-3022-00	1458 IC		1				
	120-3038-00	1590G IC		1				
	130-0102-23	1KΩ QW		3				
	130-0182-23	1.8KΩ QW		1				
	130-0302-23	3KΩ QW		1				
	130-0432-23	4.3KΩ QW		1				
	130-0512-23	5.1KΩ QW		1				
	130-0243-23	24KΩ QW		1				
	130-0303-23	30KΩ QW		1				
	130-0104-23	100KΩ QW		4				

BILL OF MATERIAL

RADIO CORPORATION	OLATHE KANSAS 66061	ASS'Y NAME Modulator	NUMBER
		UNIT TYPE R.F. GENERATOR	ASS'Y DWG. NO

SHT 2 OF 2

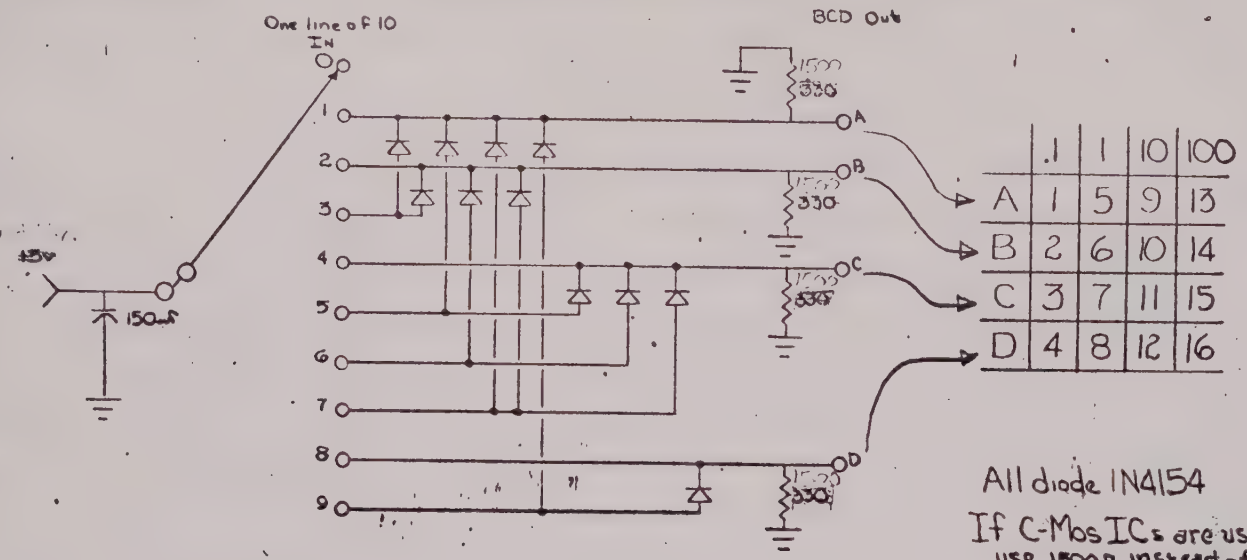
ED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

EM	PART NUMBER	DESCRIPTION	PT NO U/M					
	130-0105-23	1MΩ QW		1				
	133-0096-30	2KΩ Pot		3				

SEE LAST SHT FOR DEVIATION

BCD CODE SWITCH

This board contains 4 - S.p. 10T. switches, pull down resistors, and a diode matrix. The matrix converts 1 line of 10 to BCD information and is available on the output connector with L.S.B. "A" on pin 1. Ground and +11 volts are hard wired to the board.



	.1	1	10	100
A	1	5	9	13
B	2	6	10	14
C	3	7	11	15
D	4	8	12	16

16 pin cable connector
TO TERMINAL BOARD

All diode 1N4154

If C-Mos ICs are used,
use 1500Ω instead of 330Ω

USE 1500Ω

Test Eng

REV	C.O. NO	DATE	BY

REQ | PART NO

SCALE | KING RAD

NAME BCD Genera

ELEC ENG | TOL UNLESS NO

MECH ENG

DRN CK | DATE 1-74 | NUMBER

CHK | DATE

BILL OF MATERIAL

: PANO CORPORATION. OLATHE KANSAS 66061

ASS'Y NAME BCD CODE GENERATOR BOARD

UNIT TYPE RF GENERATOR

NUMBER

SHT OF

ASS'Y DWG NO

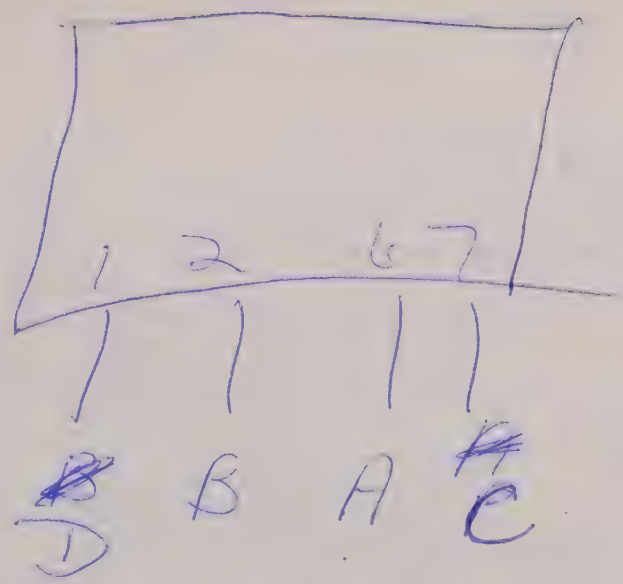
ON ASS'Y | COMPILED | DATE | CHECKED | DATE | PROJ. ENGR.

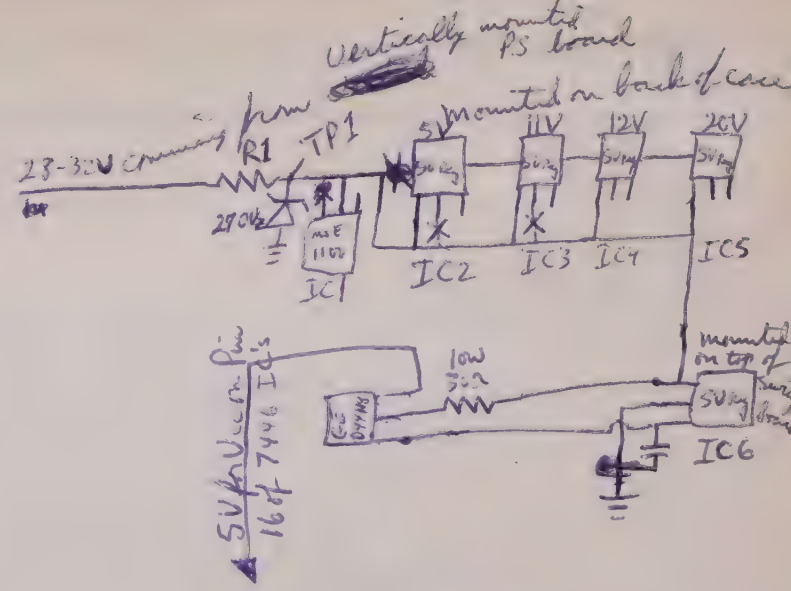
PART NUMBER	DESCRIPTION	PT NO U/M						
007-6016-00	1N4154 DIODE		44					
031-0174-00	1 POLE 10 POSITION ROTARY SWITCH		4					
033-0053-02	16 PIN IC SOCKET		1					
096-5004-04	100 uf TANTALUM CAPACITOR		1					
130-0152-23	1.5KΩ RESISTOR ¼W		16					

A 3/67

SEE LAST SHT FOR REVISION

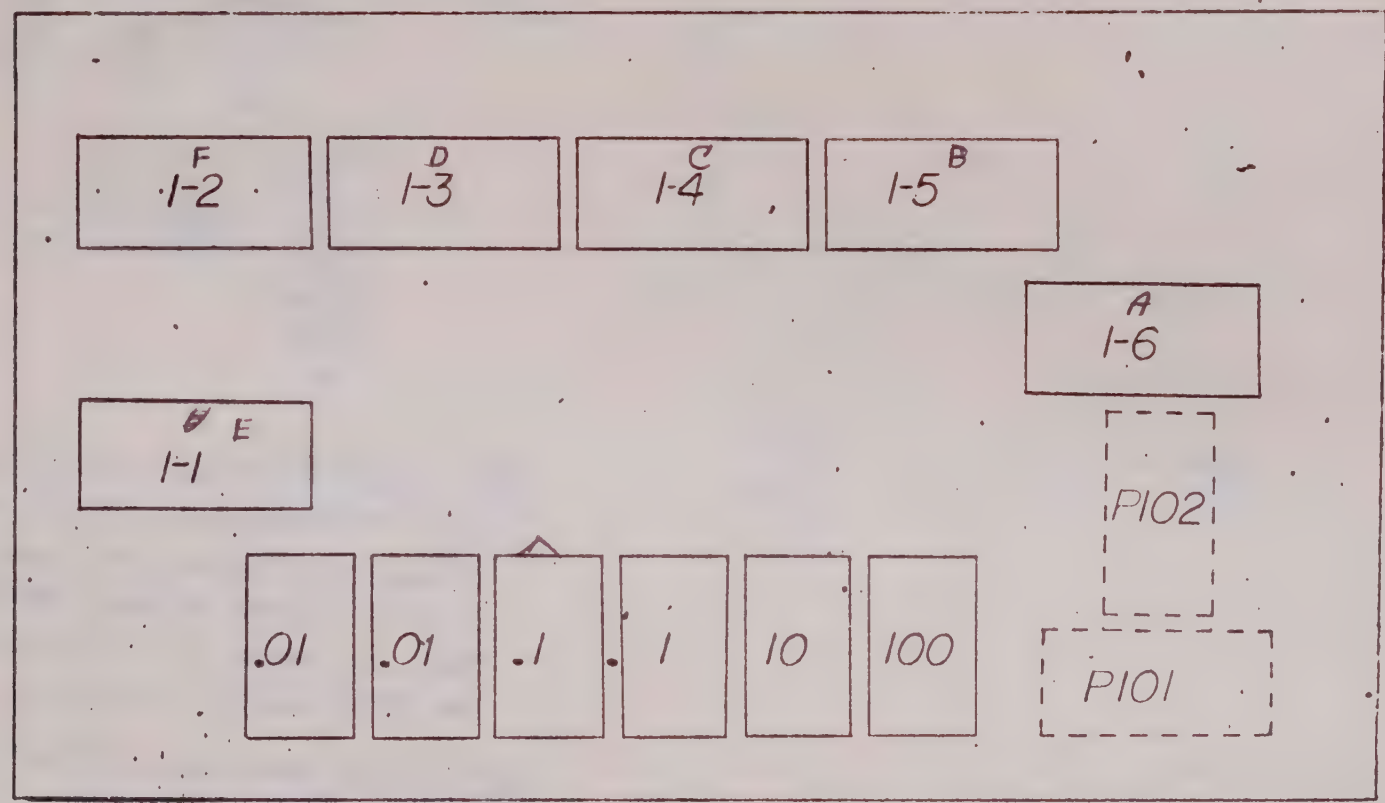
A B C D
0 0 0 0





R1 Selected to give max of 25V at TP1.
NOTE: If Voltage at TP1 goes too high then noise will intermittantly come on PS Lines + the number Readouts (LED's) will Dim. This is caused by too high working voltage on IC6 which eventually destroyes it.

R1 + 27Vz are mods Added by Kwells starting 8-76. Mounted on back panel



REV	C.O. NO	DATE	BY

REQ	PART NO	DESCRIPTION	ITEM

SCALE

KING RADIO CORPORATION

OLATHE KANSAS 66061

NAME

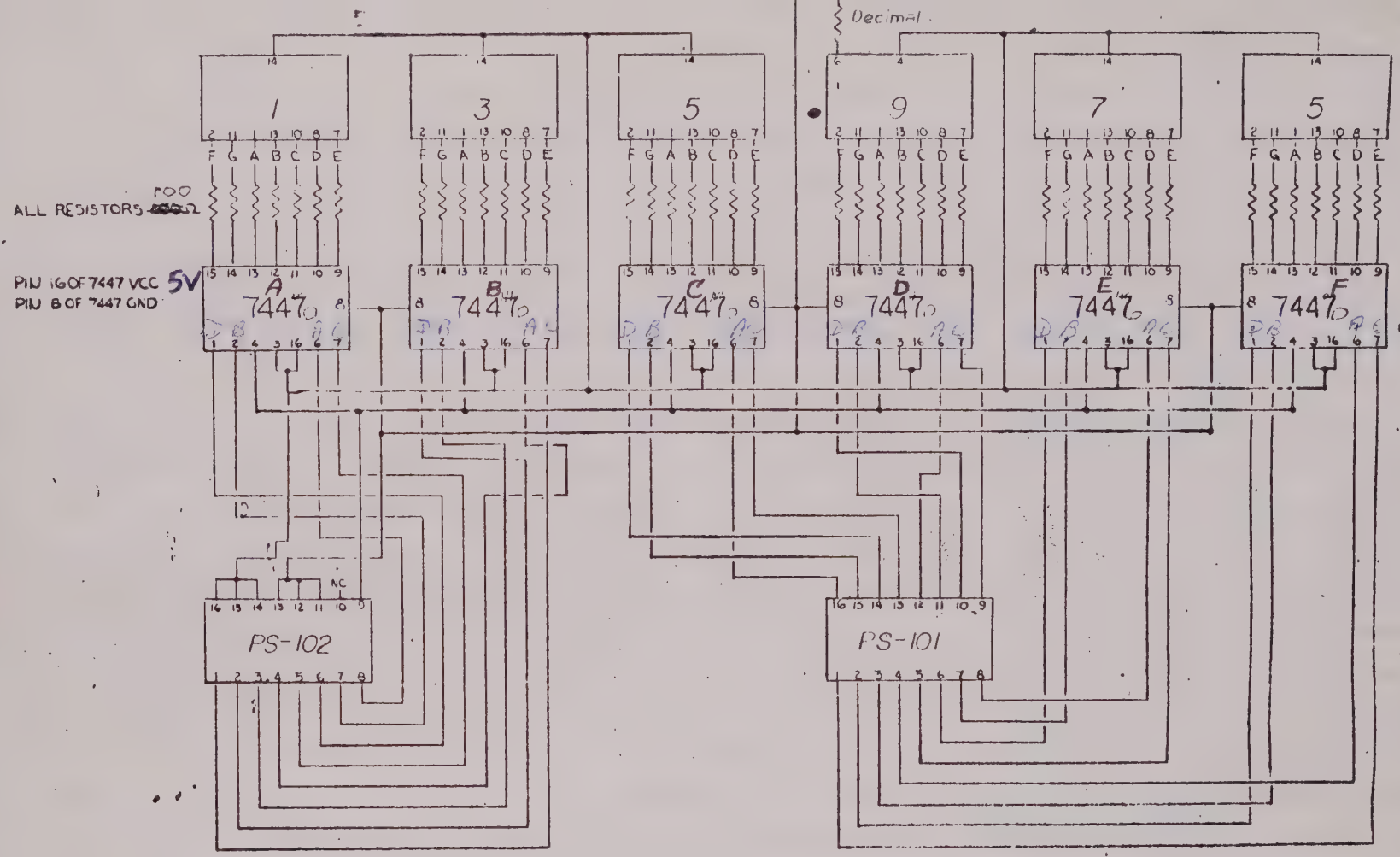
Six Digit Display Driver Pictorial

ELEC ENG | TOL UNLESS NOTED | MAT'L

MECH ENG

DRN | DATE | NUMBER | SHT

CHK | DATE | OF



7446 USED INSTEAD OF 7447

PS101 & PS102 CONNECT TO TERMINA

Test Eq

REV	C.O. NO	DATE	BY

REQ	PART NO
SCALE	KING BA
NAME	
ELEC ENG	TOL UNLESS NO
MECH ENG	
DRN	DATE
CHK	DATE

BILL OF MATERIAL

PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME DISPLAY-RF READOUT BOARD	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

D ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

M	PART NUMBER	DESCRIPTION	PT. NO U/M					
	033-0053-01	14 PIN IC SOCKET		6				
	033-0053-02	16 PIN IC SOCKET		8				
	130-0101-23	100Ω RESISTOR QW		43				
		DIGITAL READOUTS (OUTSIDE PURCHASE)		6				
		7446 DRIVER IC'S (OUTSIDE PURCHASE)		6				

SEE LAST SHT FOR REVISION

BILL OF MATERIAL

: PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME DISPLAY EXTENDER	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

D ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

M	PART NUMBER	DESCRIPTION	PT NO U/M					
	033-0053-01	14 PIN IC SOCKET		12				

30 A 3/67

SEE LAST SHT FOR REVISION

SENSOR BOARD

This board contains 8 independent sensing circuits, 4 high sense and 4 low sense. By using a circuit jumper, a high and a low sense can have their inputs connected together to form a window circuit. This board uses 3 window circuits, inputs #1, #2, and #3. Circuit #1 senses +5 volts high and low, #2 senses +11 volts high and low, and #3 senses +16 high and low. Each sensing circuit has an adjustable limit and an input voltage divider for greater than power supply voltages. Each circuit has a PNP output transistor for driving indicators and the board contains 2 - 3 terminal regulators (+5 volts and +20 volts). All inputs and outputs are hard wired.

CALIBRATION OF SENSOR BOARD

Preset the 7 sensor black pots and the 1 square blue pot to fully CCW. These are input voltage dividers.

Preset the finger pots to approximately mid-range. These are reference range pots. These 16 pots, once set in initial calibration, should not need further adjustment.

There are 4 oblong blue pots on the left side of the sensor board. These are low sense reference voltage adj. pots. The input voltage, to one side of the OP amp, is compared to this reference voltage.

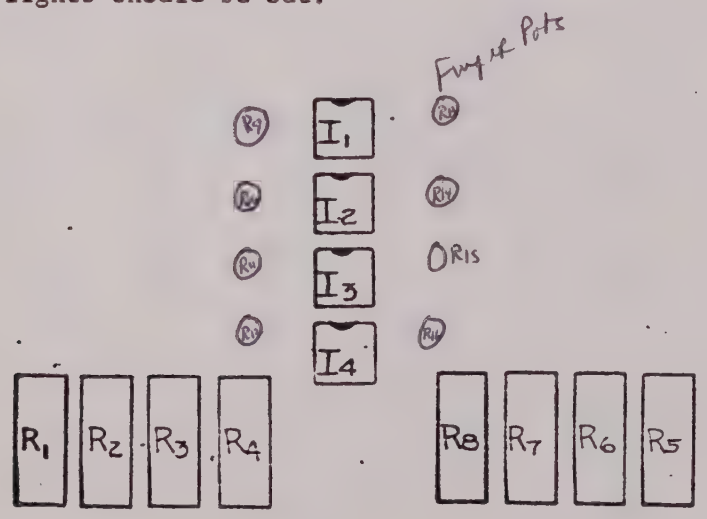
The far left pot (R1) is 5 volt low reference. Next right (R2) is 11 volt low reference and next right (R3) is 16 volt low reference. The next right (R4) pot is not used.

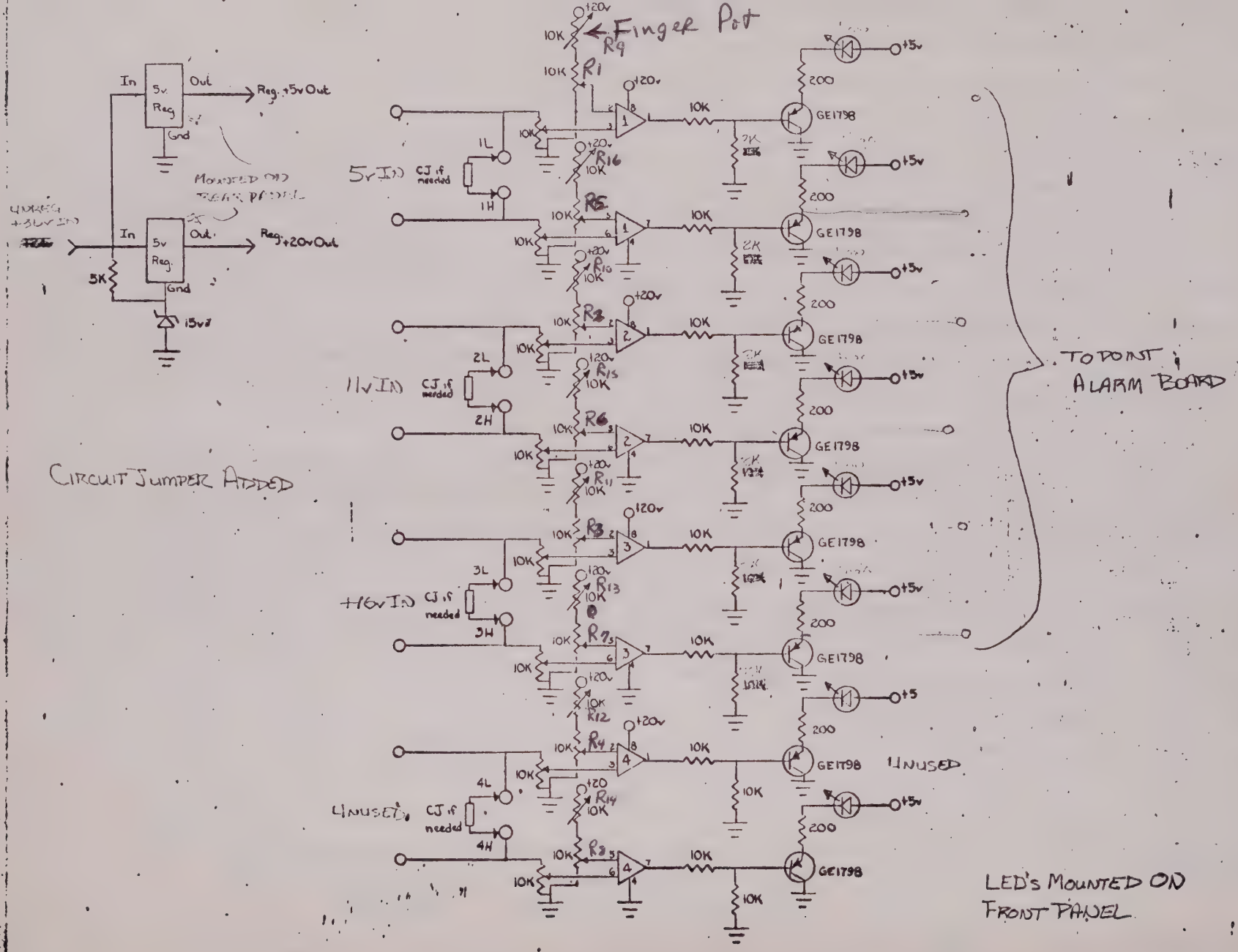
Measure the voltage on pin 3 of I1 and subtract .2 volt from the voltage. Adj. R1 for this as measured on pin 2 of I1.

Do the same for I2 and I3 measuring on the same pin numbers while adjusting R2 and R3 respectively.

The far right pot (R5) is 5 volt high reference. Measure the voltage on pin 6 of I1 and add .2volt. Adj. R5 for this voltage as measured on pin 5 of I1. Do the same for I2 and I3 measuring on the same pin numbers while adjusting R6 and R7 respectively.

All high-low lights should be out.





Finger Pot
R9
R1
R16
R5
R10
R2
R15
R6
R11
R3
R13
R7
R12
R4
R14
R8
5v IN
11v IN
+16v IN
4 UNUSED
CJ if needed
1L
1H
2L
2H
3L
3H
4L
4H
10K
2K
200
GE1798
+5v
+5
+20v
In
Out
5v Reg
Gnd
Reg. +5v Out
Reg. +20v Out
MOUNTED ON REAR PANEL
5K
15v
CIRCUIT JUMPER ADDED
TO POINT ALARM BOARD
LED's MOUNTED ON FRONT PANEL

BILL OF MATERIAL

PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME Sensor Board	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

A	PART NUMBER	DESCRIPTION	PT NO U/M					
	001-0210-00	GE1798 PNP TRANSISTOR		8				
	001-5011-18	11v Zener		1				
	120-3022-00	ML1458 OpAmp		4				
	120-3076-00	3 Terminal 5v Regulator		2				
	130-0201-23	200Ω Resistor Qw		3				
	130-0202-23	2KΩ Resistor Qw		8				
	130-0432-23	4.3KΩ Resistor Qw		16				
	130-0103-23	10KΩ Resistor Qw		8				
	133-0016-03	10KΩ Fink Pot		16				
	133-0051-07	10K Pot		16				

SEE LAST SHT FOR REVISION

PRESET MATRIX

This is a plug in card composed of 23 lines of diodes. An external switch selects which line of diodes is in the circuit, with the output lines carrying a BCD code. This set of codes and the BCD code switch output are always available to the Data multiplexer which selects the type of data needed. Codes for the BCD switch and preset matrix are the same for a given frequency.

Frequency Preset		A B	C D E F	G H I J	K L	
108.000	1	0 0	0 0 0 1	0 0 0 0	0 0	1
108.100	2	0 0	0 0 0 1	1 0 0 0	0 0	2
	3					3
	4					4
112.300	5	1 0	0 1 0 0	1 0 1 0	0 0	5
113.000	6	1 0	1 1 0 0	0 0 0 0	0 0	6
	7					7
	8					8
117.900	9	1 0	1 1 1 0	1 0 0 1	0 0	9
117.950	10	1 0	1 1 1 0	1 0 0 1	1 0	10
	11					11
	12					12
118.025	13	1 0	0 0 0 1	0 0 0 0	0 1	13
135.000	14	1 1	1 0 1 0	0 0 0 0	0 0	14
	15					15
	16					16
126.500	17	0 1	0 1 1 0	1 0 1 0	0 0	17
126.700	18	0 1	0 1 1 0	1 1 1 0	0 0	18
	19					19
	20					20
118.000	21	1 0	0 0 0 1	0 0 0 0	0 0	21
135.975	22	1 1	1 0 1 0	1 0 0 1	1 1	22
		A B	C D E F	G H I J	K L	23

Diode Rows

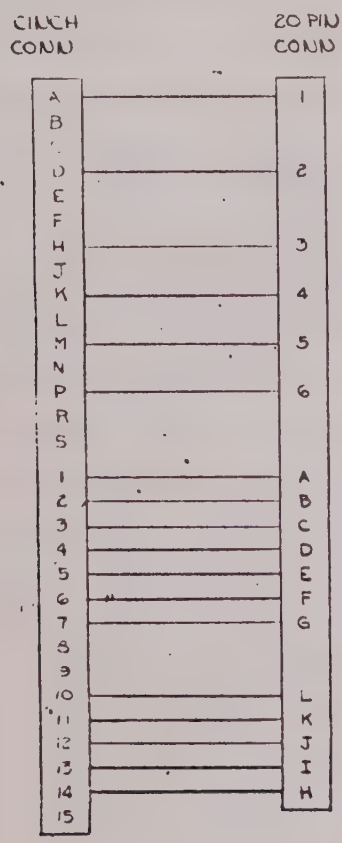
	1	A	1,2,3,4
	2	D	5,6,7,8
	3	H	9,10,11,12
	4	K	13,14,15,16
	5	M	17,18,19,20
	6	P	
13	A	1	
14	B	2	
15	C	3	
16	D	4	
9	E	5	
10	F	6	
11	G	7	
12	H	14	
5	I	13	
6	J	12	
7	K	11	
8	L	10	

	10s MHz	1s MHz	.1s MHz	.01 MHz
Example BCD Code for 02.0001 MHz			00 0001 0000	00
135.975 MHz			11 1010 1001	11

10s MHz		1s MHz	.1s MHz	.01 MHz
B3		B2C D	B3C D	B3
10	00	0-0000	0-0000	00-00
11	10	1-1000	1-1000	25-01
12	01	2-0100	2-0100	50-10
13	11	3-1100	3-1100	75-11
		4-0010	4-0010	
		5-1010	5-1010	
		6-0110	6-0110	
		7-1110	7-1110	
		8-0001	8-0001	
		9-1001	9-1001	

108.000	00	0001	0000	00
108.100	00	0001	1000	00
108.250	00	0001	0100	10
108.500	00	0001	1010	00
112.500	10	0100	1010	00
113.000	10	1100	0000	00
112.000	10	0100	0000	00
112.950	10	0100	1001	10
117.900	10	1110	1001	00
117.950	10	1110	1001	10
117.000	10	1110	0000	00
117.500	10	1110	1010	00
118.025	10	0001	0000	01
135.000	11	1010	0000	00
118.100	10	0001	1000	00
135.100	11	1010	1000	00
126.500	01	0110	1010	00
126.700	01	0110	1110	00
126.000	01	0110	0000	00
126.100	01	0110	1000	00
118.000	10	0001	0000	00
135.975	11	1010	1001	11

Terminal Board



CINCH CONN	20 PIN CONN
A	1
B	2
C	3
D	4
E	5
F	6
H	7
J	8
K	9
L	10
M	11
N	12
P	13
R	14
S	15

20 PIN CONN	
6	B
5	A
4	H
3	G
2	F
1	E
NC	L
NC	K
D	J
C	I

1 White Stripe

Diode Matrix Interconnect

BILL OF MATERIAL

PAINO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME Diode Matrix Board	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT. NO

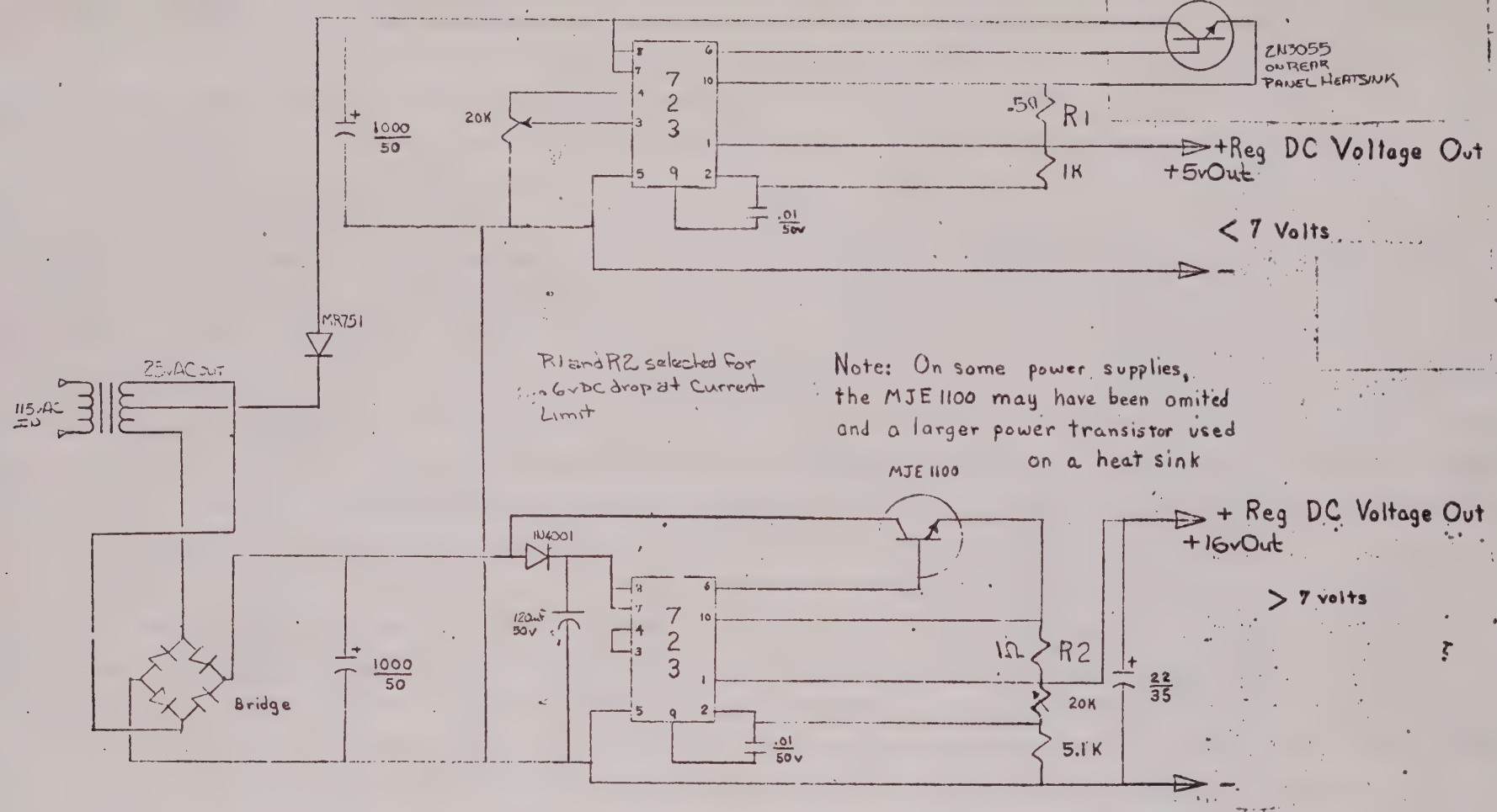
PART NUMBER	DESCRIPTION	U/M					
007-6016-00	1N4154 DIODE (SEE MATRIX CODE CHART FOR # USED)						
031-0223-00	1/6 IN LINE SPST SWITCH		3				

O A 3/67

SEE LAST SHT FOR REVISION

POWER SUPPLY CALIBRATION

The pot on the left side of the board, closest to the left side panel is the +5V power supply. The other pot on the P.S. board is the +16V Power Supply. Monitor the voltages out and adjust the +5V DC Supply for +5V ± .1V and adjust the +16VDC Supply for the +16V ± .1V. The unregulated power supply in the center of the board will be about +36V unloaded and +30V loaded.


2N3055
ON REAR
PANEL HEATSINK
7
2
3
1000
50
20K
.01
50v
.5Ω
R1
1K
+Reg DC Voltage Out
+5vOut
< 7 Volts
MR751
25vAC OUT
115vAC
IN
R1 and R2 selected for
~6vDC drop at Current
Limit
Note: On some power supplies,
the MJE 1100 may have been omited
and a larger power transistor used
on a heat sink
MJE 1100
+ Reg DC Voltage Out
+16vOut
> 7 volts
1N4001
120uf
50v
1Ω
R2
20K
5.1K
22
35
Bridge

BILL OF MATERIAL

PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME 11A Power Supply	NUMBER	SHT OF
	UNIT TYPE RF GENERATOR	ASS'Y DWG NO	

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

A	PART NUMBER	DESCRIPTION	PT NO U/M					
	007-0206-00	MJE 1100 DARLINGTON		1				
	007-6024-00	1N4001 DIODE		1				
	007-6066-00	BRIDGE RECTIFIER		2				
	007-6073-00	MR751 POWER DIODE		1				
	010-0034-00	TIE POINT		1				
	033-0053-01	14 PIN IC SOCKET		2				
	076-0197-00	POST INT THREADED		2				
	095-0005-01	1000uf 50V		3				
	096-1030-30	22uf 35V TANTALUM		1				
	096-1046-00	100uf 10V AXIAL LEAD		1				
	096-5004-01	120uf 50V AXIAL LEAD		1				
	113-6103-00	.01uf 50V DISC		2				
	120-3023-01	LM723 VOLTAGE REGULATOR		2				
	130-0010-33	1Ω ½ watt		1				
	130-0102-23	1KΩ QW		1				
	130-0752-23	7.5KΩ QW		1				
	132-0116-11	.5Ω		1				
	133-0096-58	20KΩ 10 TURN POT		2				

SEE LAST SHT FOR REVISION

BILL OF MATERIAL

PANO CORPORATION
OLATHE KANSAS 66061

ASS'Y NAME: POWER SUPPLY HEAT SINK
UNIT TYPE: RF GENERATOR

NUMBER
SHT OF
ASS'Y DWG NO

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

PART NUMBER	DESCRIPTION	PT NO U/M					
007-0058-00	2N3055		1				
031-0162-00	THERMAL SWITCH		1				
033-0027-01	TRANSISTOR SOCKET		1				
047-2607-01	HEAT SINK		1				
076-0164-04	SPACER 4-40 1/2"		4				
089-5907-08	SCREW TRANSISTOR MOUNT		2				
089-6068-05	SCREW TRANSISTOR SOCKET MOUNT		1				
089-	SCREW THERMAL SWITCH HOLD DOWN		2				
089-2140-00	NUT 4-40 SELF LOCKING		6				
091-0004-00	MICA WASHER FOR 2N3055		1				

SEE LAST SHT FOR REVISION

BILL OF MATERIAL

: PANO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME AC PANEL	NUMBER	SHT OF
	UNIT TYPE REGENERATOR	ASS'Y DWG NO	

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

PART NUMBER	DESCRIPTION	PT. NO U/M					
031-0071-00	SPDT SWITCH		1				
033-0040-00	FUSE HOLDER		1				
036-0030-00	FUSE MDL ½ AMP SLO-BLO		1				
091-0007-02	LINE CORD HOLDER		1				
OUTSIDE PURCHASE	LINE CORD		1				
OUTSIDE PURCHASE	25.2 VAC 3 AMP TRANSFORMER (RADIO SHACK)		1				

SEE LAST SHT FOR REVISION

BILL OF MATERIAL

RADIO CORPORATION	OLATHE KANSAS 66061	ASS'Y NAME Blown Fuse & AC Power ON	NUMBER / SHT OF
		UNIT TYPE R.F GENERATOR	ASS'Y DWG. NO

ED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT NO

EM	PART NUMBER	DESCRIPTION	U/M					
	007-5011-05	3.3v ZENER		1				
	007-5011-13	5.6v ZENER		1				
	007-5011-15	7.5v ZENER		1				
	007-6024-00	1N4001 DIODE		1				
	007-6047-00	1N4005 DIODE		1				
	096-1030-02	1uf 35v TANTALUM		2				
	120-3026-00	5v 3 terminal REGULATOR		4				
	130-0101-23	100Ω QW		1				
	130-0471-33	470Ω ½ watt		1				
	130-0152-33	1.5KΩ ½ watt		2				
	132-0105-82	750		1				
	132-0105-87	1K		1				

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SEE LAST SHT. FOR REVISION

BILL OF MATERIAL

RADIO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME CASE	NUMBER	SHT OF
	UNIT TYPE R.F GENERATOR	ASS'Y DWG. NO	

USED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT NO

ITEM	PART NUMBER	DESCRIPTION	U/M	
		FRONT PANEL		1
		115VAC PANEL		1
		REAR PANEL		1
		BOTTOM PANEL		1
		TOP PANEL		1
		SIDE SUPPORT		4
		PANEL SUPPORT - HORZ		2
		PANEL SUPPORT & FRONT TRIM SUPPORT		8
		SIDE PANEL - LEFT		1
		SIDE PANEL - RIGHT		1
		STOP ARM SUPPORT BRACKET		1
		FRONT PANEL TRIM - HORZ		2
	089-5111-04	4-40 SCREW 1/4" BLACK		14
	089-5111-06	4-40 SCREW 3/8" BLACK		14
	089-5111-08	4-40 SCREW 9/16" BLACK		6
	089-6008-03	4-40 SCREW 1/4		2
	089-6008-05	4-40 SCREW 3/8		6
	089-5436-08	4-40 SCREW 9/16		6
	089-5800-03	2-56 SCREW 1/4		12
	OUTSIDE PURCHASE	SCREEN VENTS		6

SEE LAST SHT FOR REVISION

BILL OF MATERIAL

RADIO CORPORATION — OLATHE KANSAS 66061	ASS'Y NAME Total Bill	NUMBER	SHT 1 OF 4
	UNIT TYPE	ASS'Y DWG. NO	

USED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT NO

ITEM	PART NUMBER	DESCRIPTION	U/M						
	001-0053-00	CM3055		1					
	007-0018-00	2N2415 NPN Transistor		7					
	007-0206-00	PJE2100		1					
	007-0210-00	[illegible]		10					
	007-5011-16	5.1v Zener		2					
	007-5011-13	[illegible] Zener		1					
	007-5020-00	5.1v Zener		1					
	007-6016-00	1N4154 Diode		15+					
	007-6024-00	1N4001 Diode		1					
	007-6025-00	1N914 Diode		4					
	007-6066-00	Bridge Rectifier		2					
	007-6074-00	[illegible] Diode		1					
	007-7007-00	LED		23					
	078-0042-00	BNC [illegible]		1					
	016-0034-00	Tie Band		8					
	030-0004-00	[illegible] Connector		1					
	030-[illegible]-02	12 Pin Connector							
	030-[illegible]-01	20 Pin Connector							
	031-0071-00	SPDT Switch		1					
	031-0174-00	[illegible]		4					
	031-0226-02	DPDT Push Button Mod on-off + Push on-off		2					
	031-0273-00	7 [illegible]		[illegible]					
	038-0027-01	[illegible]		1					
	038-0040-00	[illegible]		1					

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SEE LAST SHT FOR REVISION

BILL OF MATERIAL

RADIO CORPORATION — OLATHE KANSAS 66061	ASS'Y NAME: TOTAL BILL	NUMBER	SHT 2 OF 4
	UNIT TYPE	ASS'Y DWG. NO	

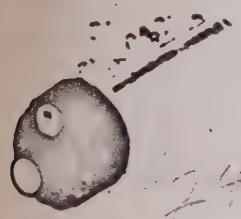
USED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT NO

ITEM	PART NUMBER	DESCRIPTION	U/M					
	035-0016-00	[illegible]		9				
	033-0053-01	[illegible]		30				
	033-0053-02	16 Pin [illegible]		19				
	047-1857-00	Hinge [illegible] 035-0[illegible] 00 [illegible] (1)		1				
	047-[illegible]-01	[illegible]		1				
	073-0[illegible]-00	[illegible]		4				
	076-0164-00	[illegible]		4				
	076-0197-00	[illegible]		2				
	089-2136-00	Self Lock [illegible]						
	089-2140-00	Self Lock [illegible] 4-40						
	089-5111-04	Screw 4-40 [illegible] (Cap)		14				
	089-5111-06	Screw 4-40 x [illegible] (Cap)		14				
	089-5111-08	Screw 4-40 x [illegible] (Cap)		[illegible]				
	089-5436-03	Screw 4-40 x [illegible] (Cap)		[illegible]				
	089-5357-06	Self Screw [illegible]		1				
	089-5373-04	Screw 4-40 x [illegible]						
	089-5878-05	Screw 4-40 x [illegible]						
	089-5878-06	Screw 4-40 x [illegible]						
	089-5[illegible]-03	Screw 2-56 x [illegible] (Cap)		12				
	089-5807-03	[illegible]		[illegible]				
	[illegible]	[illegible]		[illegible]				
	089-6003-05	Screw 4-40 x [illegible] (Cap)		[illegible]				
	091-0[illegible]-00	[illegible]		1				
	091-0135-00	[illegible]		5				

X-1230 A 3/67

SEE LAST SHT FOR REVISION

Rotary Attenuators



0-100 dB
0-110 dB

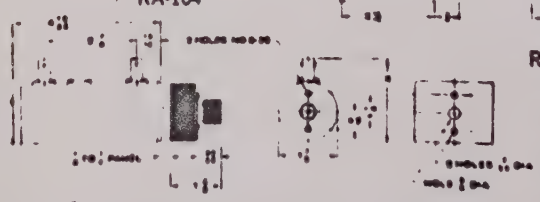
240
3-4 Weeks

RA–100 and RA–104

The RA–100 and RA 104 extend the maximum attenuation range of the RA series of panel mount attenuators to 110 dB. The RA–100 provides 0 to 100 dB of attenuation in 10 dB steps, while the RA–104 provides 0 to 110 dB in 1 dB steps. These units have superior low and high frequency specifications with accuracy specified to 1000 MHz. Extremely reliable and rugged construction is a consequence of the simple, yet unique, mechanical design. The units are small, occupying less than 1 7/8 inch (4.76 cm) diameter of panel space, and have simple "turn only" indexing. Typical attenuation and VSWR performance curves are shown with the specifications. The performance curves can be used to predict performance at frequencies where specifications are not quoted.

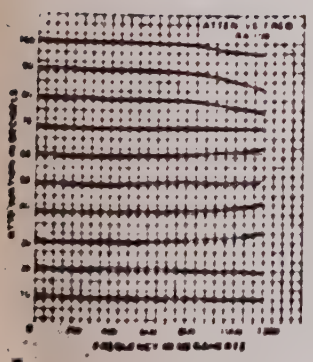
SPECIFICATIONS	RA–100	RA–104
Attenuation	0 to 100 dB in 10 dB steps	0 to 110 dB in 1 dB steps
Impedance	50 ohms	50 ohms
Frequency Range	DC to 1200 MHz	DC to 1000 MHz
Accuracy	±1% at 30 MHz ±3% at 500 MHz ±5% at 1000 MHz	0 to 10 dB ±0.1 dB at 30 MHz ±0.3 dB at 500 MHz ±0.4 dB at 1000 MHz 11 to 110 dB ±1% at 30 MHz ±3% at 500 MHz ±5% at 1000 MHz
Insertion Loss	Less than 0.3 dB at 1000 MHz	Less than 0.5 dB at 1000 MHz
Maximum VSWR (typical)	1.3:1 at 1000 MHz	1.3:1 at 1000 MHz
Maximum Dissipation	0.5 watt (average) at 25°C	0.5 watt (average) at 25°C
Peak Power Handling Capability	1000 watts	1000 watts
Operating Temperature Range	-20°C to +125°C	-20°C to +125°C
Rotation Angle Between Steps	30°	30°
Standard Connectors Available	BNC Female, TNC Female, Type N Female, SMA Female	Type N Female, TNC Female, BNC Female, SMA Female
Mechanical Construction	Irridited Aluminum Housing	Irridited Aluminum Housing
Weight	13.5 oz. (.38 kg)	20 oz. (.57 kg)

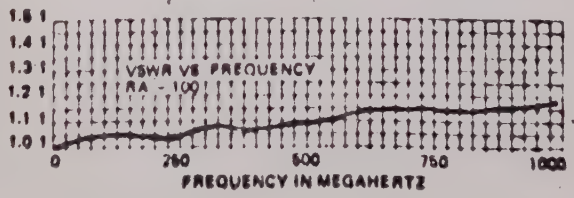
RA-104

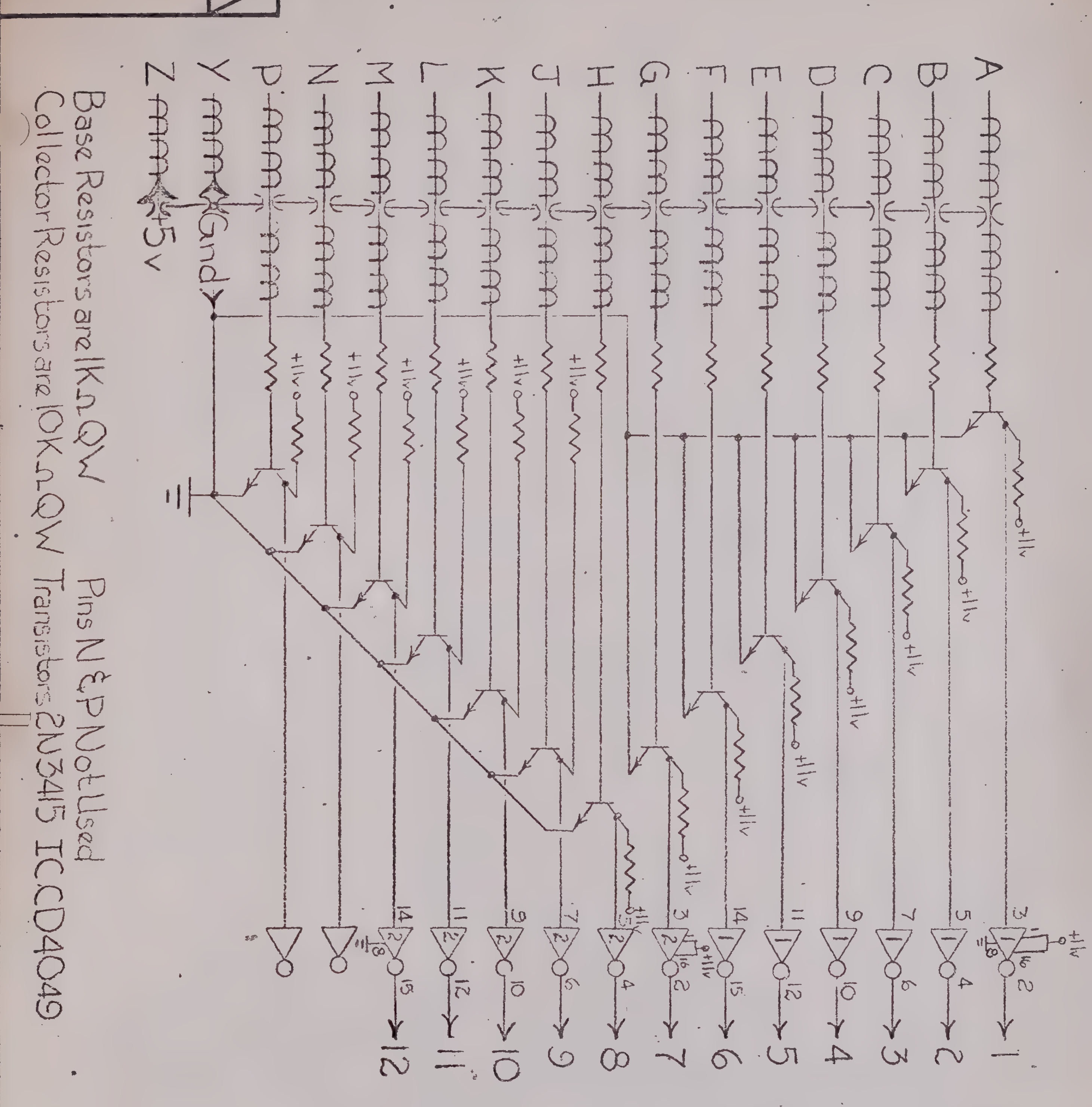


RA-100

	X
BNC	2¾"
TNC	2¾"
N	2¾"
SMA	2¾"







SCALE	RADIO CORPORATION	OLATHE KANSAS 66061

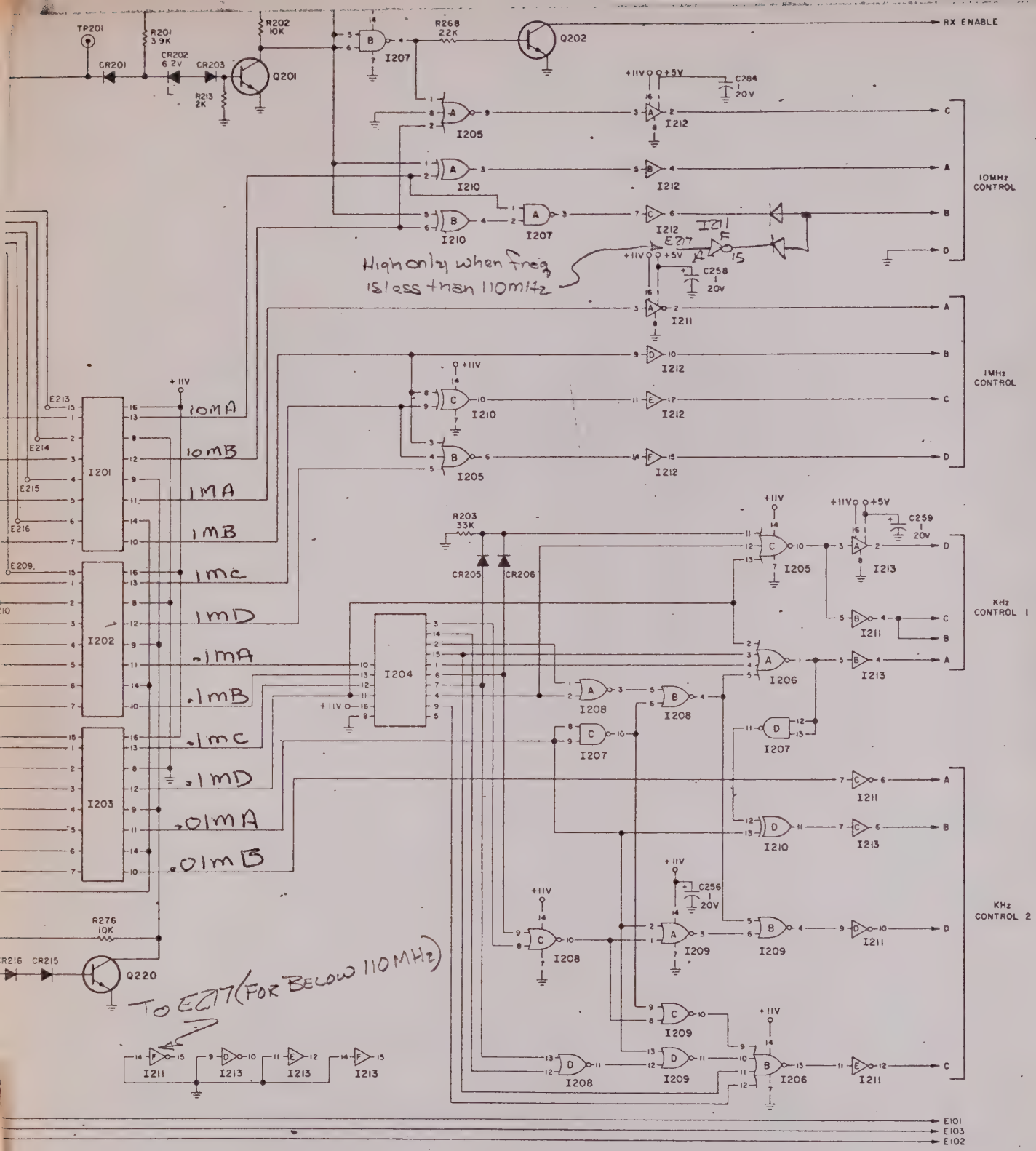
NAME: Level Shifter

ELEC ENG	TOL UNLESS NOTED	MAT'L
MECH ENG		

DRN CK	DATE 5-75	NUMBER	SHT
CHK	DATE		OF

REV	C.O. NO	DATE	BY

K-1219 1-67



PRINTING INSTRUCTIONS

DO NOT PRINT THIS FORM IN MANUAL

FIG NO 6-32A

PAGE NO 6-8

% of ORIG SIZE 43

SPECIAL INSTRUCTIONS:

K-1498 3-71

RADIO CORPORATION

KTR-905

CHANNELING LOGIC SCHEMATIC

CCG 12/10/72

002-0318-04

1 2

BILL OF MATERIAL

KING RADIO CORPORATION — OLATHE KANSAS 66061

ASS'Y NAME: System Status Alarm Board

UNIT TYPE: RF Generator

NUMBER | SHT | OF | ASS'Y DWG. NO

USED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT. NO.

ITEM	PART NUMBER	DESCRIPTION	U/M					
	007-0078-00	2N3415		1				
	007-5030-00	1N4733 5.1v Zener		1				
	007-6016-04	1N4154		18				
	033-0046-00	Transistor Socket		1				
	033-0053-01	14 Pin IC Socket		1				
	033-0053-02	16 Pin IC Socket		1				
	096-1030-00	1uf Tant Cap		1				
	096-1030-12	3.3uf Tant Cap		1				
	120-6007-00	CD4011 IC		1				
	120-6025-00	CD4049 IC		1				
	130-0222-23	2.2K QW		4				
	130-0202-23	2K QW		1				
	130-0512-23	5.1K QW		2				
	130-0682-23	6.8K QW		1				
	130-0103-23	10K QW		13				

BILL OF MATERIAL

KING RADIO CORPORATION — OLATHE KANSAS 66061

ASS'Y NAME: Level Shifter

UNIT TYPE: R.F. Generator

NUMBER:

SHT OF

ASS'Y DWG. NO:

USED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

ITEM	PART NUMBER	DESCRIPTION	PT NO / U/M					
	007-0078-00	2N3415		12				
	013-0006-02	Ferrite Beads		52				
	030-2219-00	Connector		4				
	106-0034-00	Feedthrus		14				
	120-6025-00	CD4049 IC		2				
	130-0102-23	1KΩ QW		12				
	130-0103-23	10KΩ QW		12				

BILL OF MATERIAL

[illegible] CORPORATION	OLATHE KANSAS 66061	ASS'Y NAME MODULATOR	NUMBER
		UNIT TYPE R.F. GENERATOR	ASS'Y DWG NO

SHT 2 OF 2

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

PART NUMBER	DESCRIPTION	PT. NO U/M					
130-0104-23	100KΩ QW		4				
130-0105-23	1MΩ QW		1				
133-0096-30	2KΩ POT		2				

BILL OF MATERIAL

[illegible] CORPORATION	OLATHE KANSAS 66061	ASS'Y NAME R.F. TERMINAL BOARD	NUMBER
		UNIT TYPE R.F. GENERATOR	ASS'Y DWG. NO.

SHT 1 OF 1

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

PART NUMBER	DESCRIPTION	PT. NO. U/M						
007-0078-00	2N3415 NPN TRANS		6					
007-0210-00	GE1798 PNP TRANS		2					
007-6016-04	1N4154 DIODE		13					
010-0034-20	TIE POINTS		7					
030-2219-02	12 PIN CONNECTOR		5					
030-2219-04	20 PIN CONNECTOR		2					
033-0046-00	TRANSISTOR SOCKET		8					
033-0053-01	14 PIN IC SOCKET		12					
033-0053-02	16 PIN IC SOCKET		7					
120-0001-00	7400 IC		1					
120-6006-00	CD4010 IC		2					
130-0201-23	200Ω QW		3					
130-0102-23	1KΩ QW		4					
130-0202-23	2KΩ QW		7					
130-0472-23	4.7KΩ QW		1					
130-0512-23	5.1KΩ QW		1					
130-0103-23	10KΩ QW		14					
130-0153-23	15KΩ QW		1					
130-0203-23	20KΩ QW		1					

BILL OF MATERIAL

RADIO CORPORATION	OLATHE KANSAS 66061	ASS'Y NAME AUDIO BOARD	NUMBER / SHT OF
		UNIT TYPE R.F. GENERATOR	ASS'Y DWG. NO

ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.

PART NUMBER	DESCRIPTION	PT. NO. U/M					
133-0096-30	2K Ω Pot Slot Up		3				
133-0096-31	5K Ω Pot Slot Up		1				
133-0096-32	10K Ω Pot Slot Up		1				

BILL OF MATERIAL

[illegible] CORPORATION	OLATHE KANSAS 66061	ASS'Y NAME AUDIO BOARD	NUMBER
		UNIT TYPE RF. GENERATOR	ASS'Y DWG. NO

SHT 1 OF 2

USED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT. NO.

ITEM	PART NUMBER	DESCRIPTION	U/M						
	007-5011-16	9.1v ZENER		2					
	007-6016-04	1N4154 DIODE		2					
	015-0029-00	10KΩ 10% RESISTOR PACKAGE		1					
	026-0018-00	CIRCUIT JUMPER		1					
	033-0053-01	14PIN IC SOCKET		6					
	033-0053-02	16PIN IC SOCKET		1					
	096-1030-00	1uf 35v TANT CAP		2					
	097-0056-59	10uf 63v AXIAL CAP		1					
	105-0018-14	.001uf 200v MYLAR CAP		4					
	120-3022-00	LM1458 IC		2					
	120-3023-01	LM723 IC		1					
	120-6012-00	CD4016 IC		3					
	130-0011-23	10Ω QW		1					
	130-0101-23	100Ω QW		1					
	130-0301-23	300Ω QW		1					
	130-0102-23	1KΩ QW		2					
	130-0152-23	1.5KΩ QW		1					
	130-0432-23	4.3KΩ QW		1					
	130-0582-23	5.8KΩ QW		1					
	130-0473-23	47KΩ QW		1					
	130-0513-23	51KΩ QW		3					
	130-0164-23	160KΩ QW		2					

BILL OF MATERIAL

[illegible]NO CORPORATION. OLATHE KANSAS 66061	ASS'Y NAME MODULATOR	NUMBER	SHT 1 OF 2
	UNIT TYPE R.F. GENERATOR	ASS'Y DWG. NO	

SED ON ASS'Y	COMPILED	DATE	CHECKED	DATE	PROJ. ENGR.	PT NO

TEM	PART NUMBER	DESCRIPTION	U/M					
	007-6016-00	IN4154		8				
	007-6033-00	IN270		2				
	019-2084-49	15 uh choke		2				
	019-3027-00	TOROID		3				
	047-2640-01	FENCE		1				
	047-2643-01	COVER		2				
	089-6293-04	SCREW #3-48 x 1/4		1				
	096-1030-02	1uf 35v TANT		3				
	096-1030-28	47uf 20v TANT		1				
	102-0031-00	5-30 VAR CAP		1				
	106-0034-00	FEEDTHRU 1.5Kpf		2				
	111-0001-00	103 BLUE MATCHHEAD CAP		4				
	113-3082-00	8.2pf CAP		1				
	113-3180-00	18pf CAP		2				
	120-3022-00	1458 IC		1				
	120-3038-00	1590G IC		1				
	130-0102-23	1KΩ QW		3				
	130-0182-23	1.8KΩ QW		1				
	130-0202-23	2KΩ QW		1				
	130-0302-23	3KΩ QW		1				
	130-0432-23	4.3KΩ QW		1				
	130-0512-23	5.1KΩ QW		1				

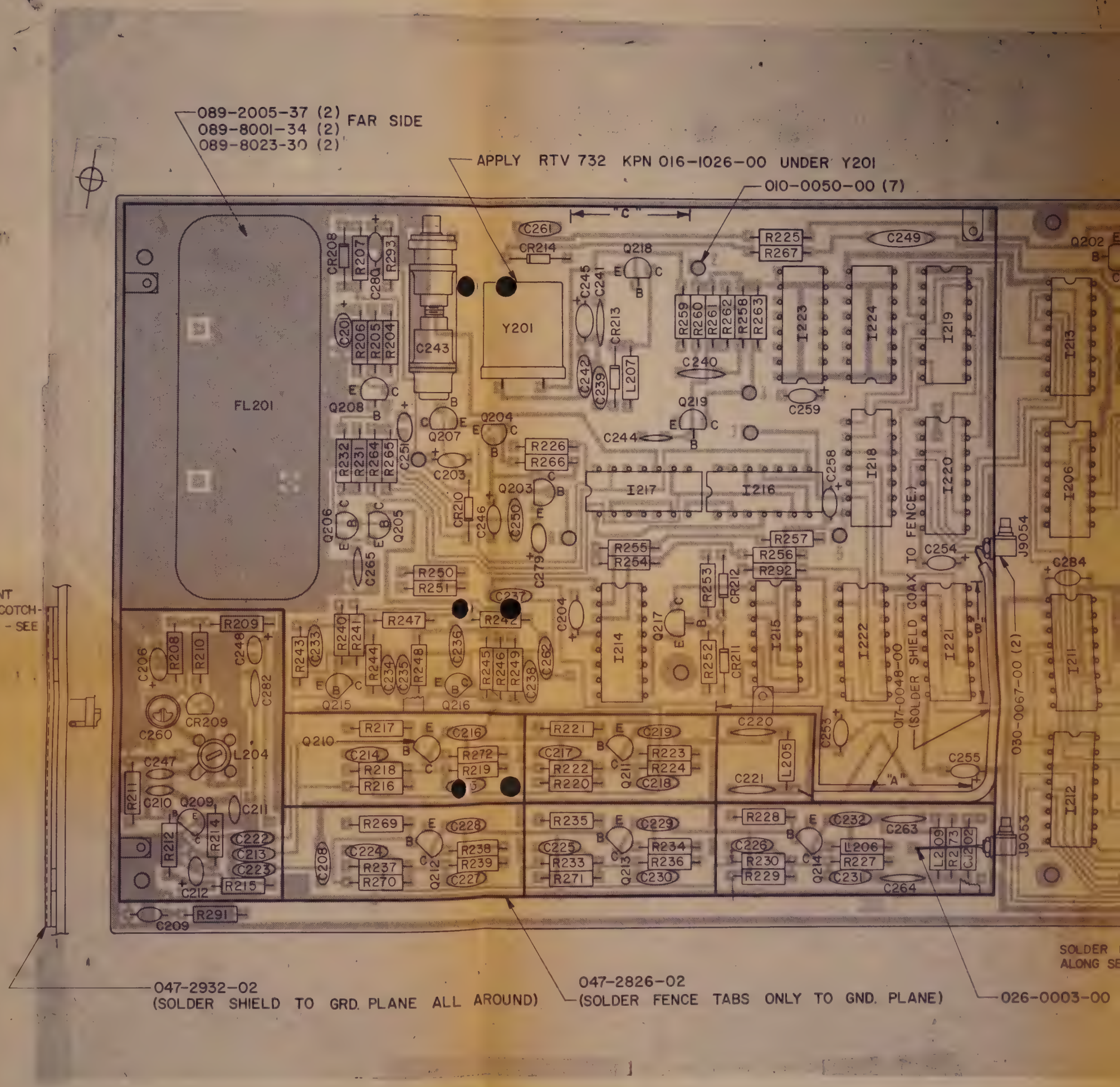
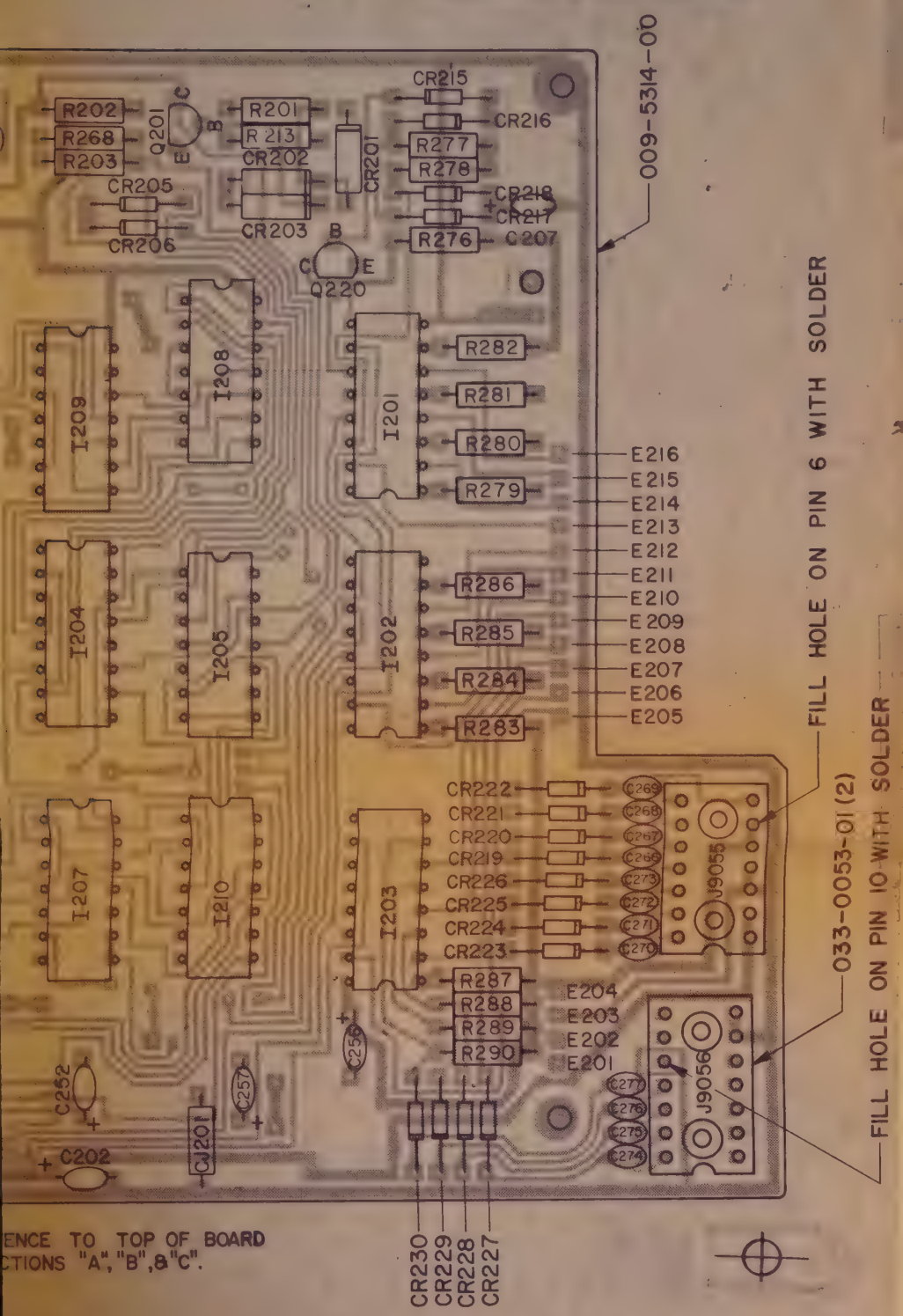

089-2005-37 (2)
089-8001-34 (2)
089-8023-30 (2)
FAR SIDE
APPLY RTV 732 KPN 016-1026-00 UNDER Y201
010-0050-00 (7)
COMPARTMENT POTTED WITH SCOTCH-CAST RESIN 221 - SEE NOTE 1.
047-2932-02
(SOLDER SHIELD TO GRD. PLANE ALL AROUND)
047-2826-02
(SOLDER FENCE TABS ONLY TO GND. PLANE)
026-0003-00
SOLDER
ALONG SE
017-0048-00
(SOLDER SHIELD COAX TO FENCE.)
030-0067-00 (2)
FL201
Y201
J9054
J9053

FIG NO.	DO NOT PRINT THIS FORM IN MANUAL
PAGE NO.	FIG NO.
% of ORIG SIZE:	PAGE NO.
	% of ORIG SIZE:



ENCE TO TOP OF BOARD
CTIONS "A","B",&"C".

NOTES —

1. APPLICATION OF POTTING RESIN — REFERENCE TO 001-0151-10 & 001-0152-13.

PRINTING INSTRUCTIONS	PRINTING INSTRUCTIONS
DO NOT PRINT THIS FORM IN MANUAL	DO NOT PRINT THIS FORM IN MANUAL
FIG NO. 5-3	FIG NO. 6-32A
PAGE NO. 5-21	PAGE NO. 6-81
% of ORIG SIZE: 60	% of ORIG SIZE: 60
SPECIAL INSTRUCTIONS:	SPECIAL INSTRUCTIONS:

K-1498 3-71 K-1498 3-71

REF. B/M 200-0597-00

REV	C.O. NO	DATE	BY
1	13139	5 DEC 73	P.M.
2	13378	JAN 74	P.M.
3	[illegible]	[illegible]	[illegible]
4	13824	3-8-74	CRH
5	[illegible]	4-2-74	JEG
6	14306	6-17-74	CRH
7	15335	1-8-74	CRH
8	15866	1-23-75	CRH

REQ	PART NO	DESCRIPTION	ITEM

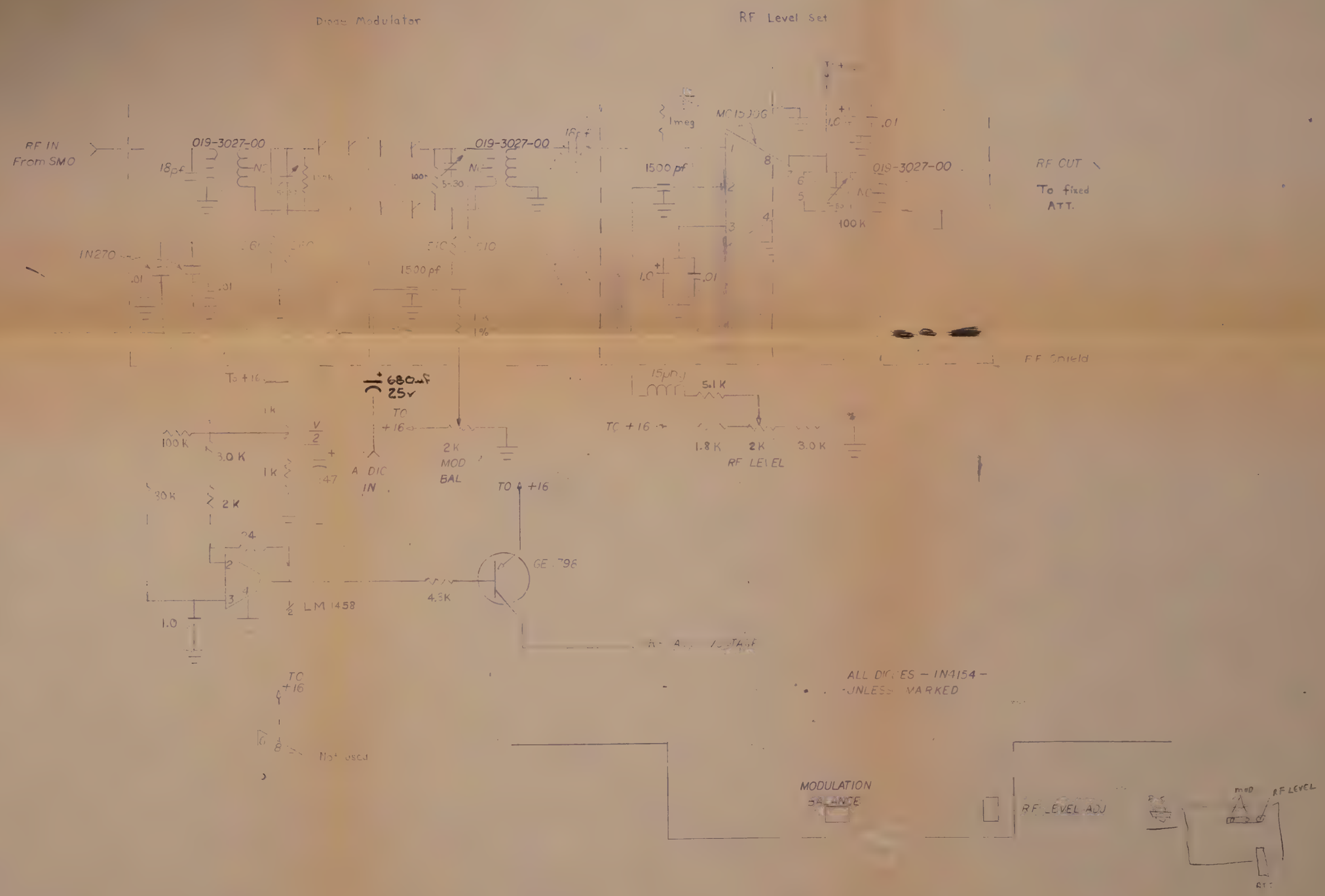
SCALE 2:1 — KING RADIO CORPORATION — OLATHE KANSAS 66061

NAME: KTR 905 SYNTHESIZER

ELEC ENG / MECH ENG — TOL UNLESS NOTED — MAT'L

DRN J.E.G. — DATE 10-10-73 — NUMBER 300-0803-00 — SHT 1 OF 1

CHK — DATE



RF Signal Gen

REQ	PART NO	DESCRIPTION	ITEM

REV	C.O. NO	DATE	BY

SCALE

KING RADIO CORPORATION
OLATHE
KANSAS
66061

NAME RF [illegible]

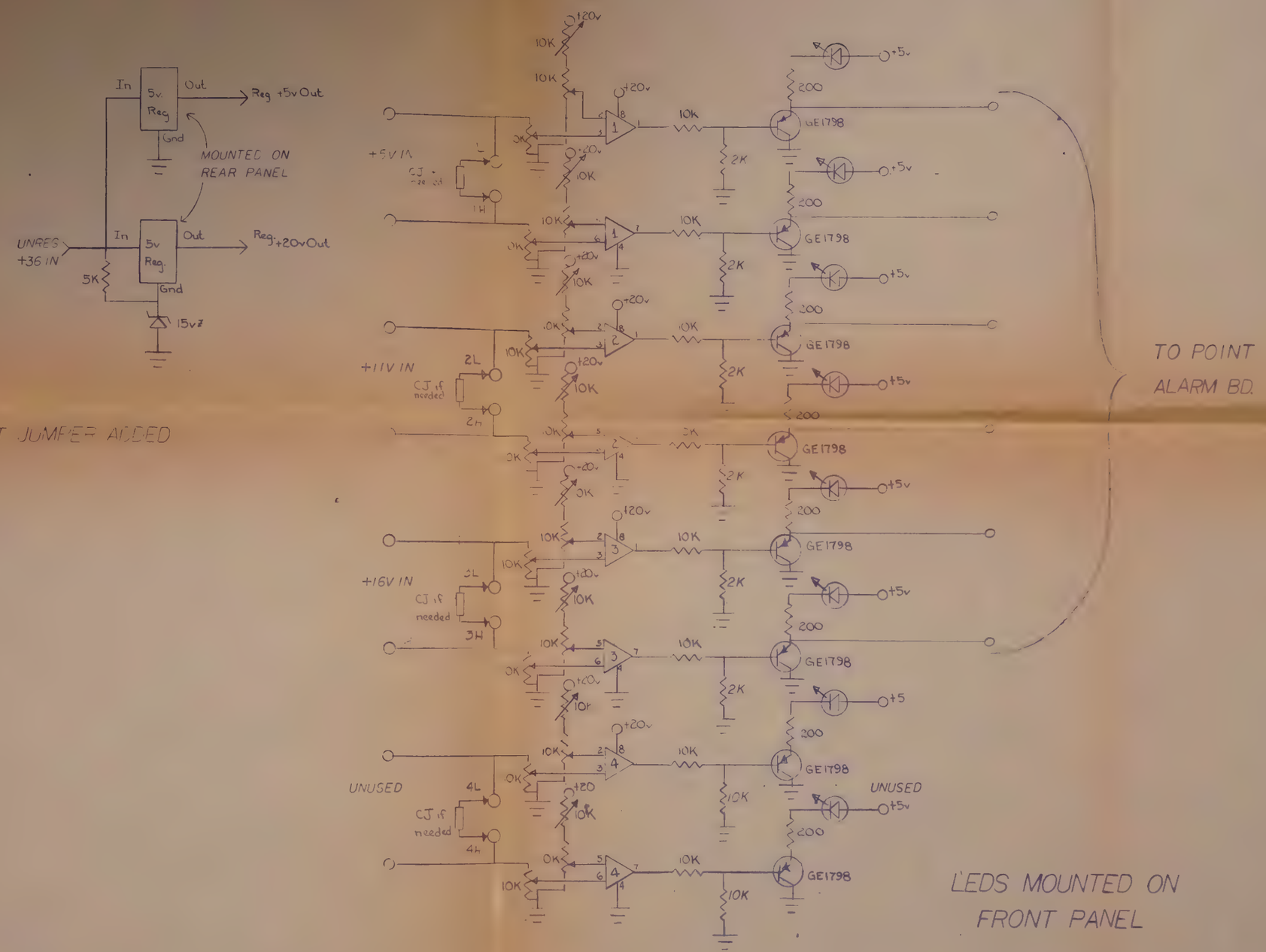
ELEC ENG | TOL UNLESS NOTED | MAT'L

MECH ENG

DRN | DATE | NUMBER | SHT

CHK | DATE | OF

K-1221 1-67



Test Engineering

REQ	PART NO	DESCRIPTION	ITEM

REV	C.O. NO	DATE	BY

SCALE N

KING RADIO CORPORATION
OLATHE KANSAS 66061

NAME Sensor Board

ELEC ENG | TOL UNLESS NOTED | MAT'L
MECH ENG

DRN CK | DATE | NUMBER | SHT
CHK | DATE | OF

K-1221 1-67

R. F. SIGNAL GENERATOR

The basic board of the R.F. Signal Generator is a modified KTR 905 S.M.O. Modifications include the addition of a modulator, R.F. A.G.C. circuitry, a variable R.F. attenuator, pull up resistors, and blown fuse indicator driver circuitry. All I.C.'s have sockets, however transistors in the S.M.O. do not because of cover height.

The usable frequency range of this generator is 106.000MHz thru 139.975 MHz although we use only 108.000MHz thru 135.975 MHz. With the select/preset switch in the select position, every 25 KHz channel is available and is read out on the display window. In the preset position, the generator frequency is selected by the 6 position push button switch on the front panel, thru the diode matrix board.

Audio is applied to the modulator through a 6 position push button switch which selects both frequency and level. External audio may be applied through a rear panel mounted B.N.C. connector and selected through the push button switch (EXT.)

The modulation ON/OFF switch disconnects audio from the modulator in the off position.

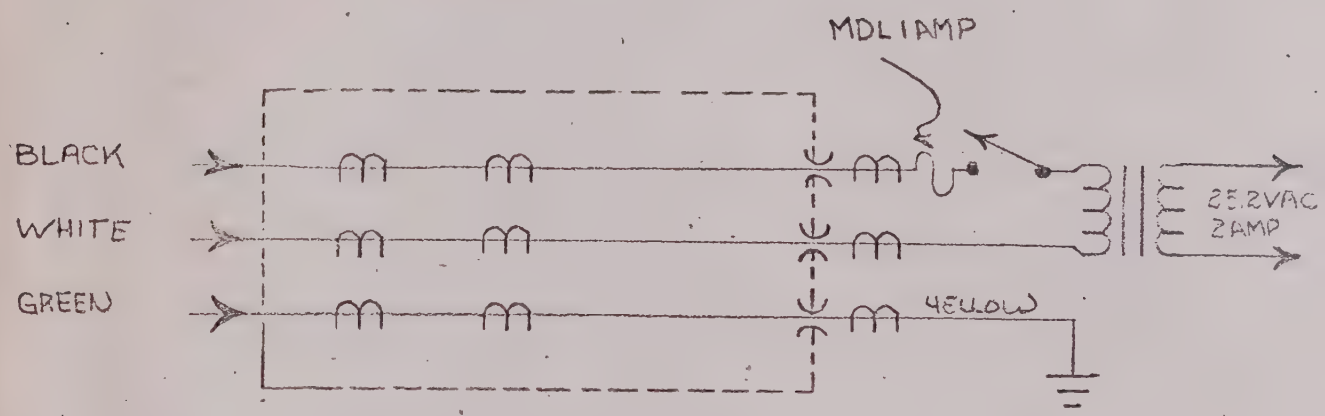
The step attenuator gives 1db steps from -10db through -109db selected and read through the rotary dial.

The L.E.D.'s are activated by the sensor board. This board senses power supply voltage limits and lights the appropriate L.E.D. when these limits are exceeded. The regulator over temp. is activated by a thermal switch mounted to the heat sink. The blown fuse indicator is directly across the fuse.

Whenever possible, all inputs and outputs are through I.C. sockets used as connectors.

Calibrate mod. section before going to audio board.

If 1458 in sensor board persists in going bad replace with 1558.

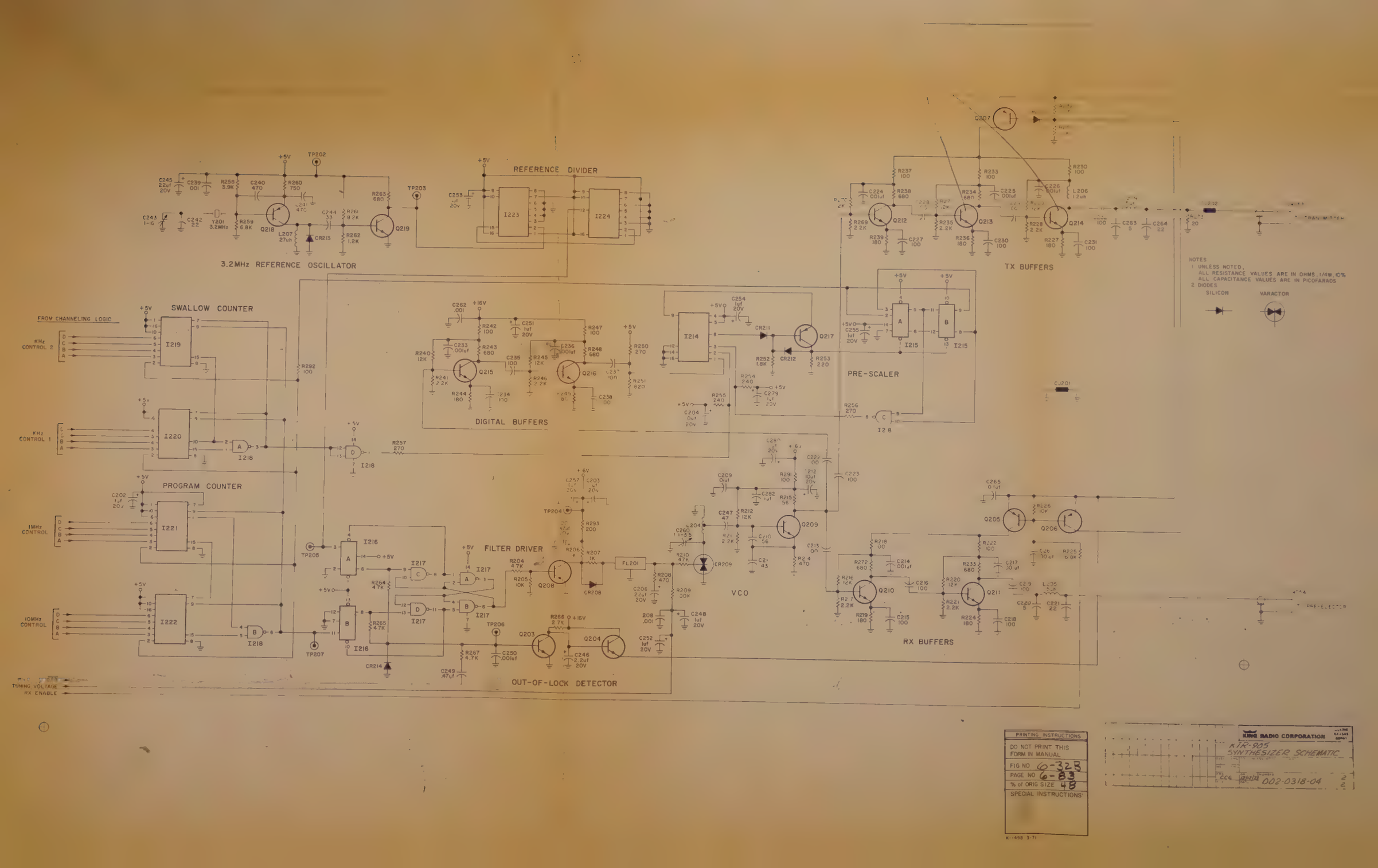


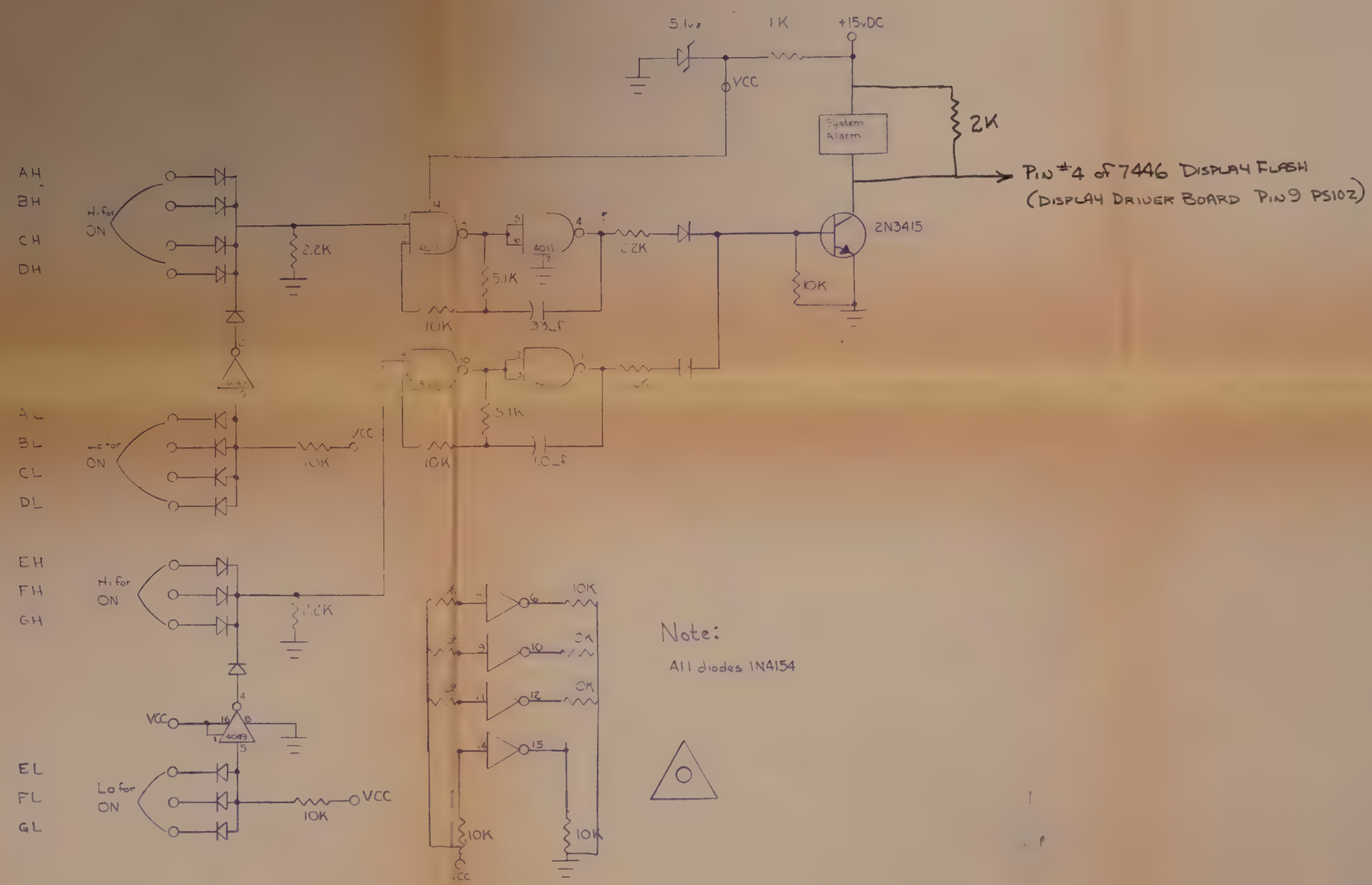
Beads 019-3045-00

Can 047-1256-00

Feedthru 106-0021-08 470pf

BY	SCALE	ING RADIO CORPORATION	O K
DATE	NAME AC Line Cord RF Filter		
	ELEC ENG	TOL UNLESS NOTED	MAT'L


3.2MHz REFERENCE OSCILLATOR
REFERENCE DIVIDER
SWALLOW COUNTER
PROGRAM COUNTER
DIGITAL BUFFERS
PRE-SCALER
TX BUFFERS
RX BUFFERS
FILTER DRIVER
VCO
OUT-OF-LOCK DETECTOR
FROM CHANNELING LOGIC
KHz CONTROL 2
KHz CONTROL 1
1MHz CONTROL
10MHz CONTROL
TUNING VOLTAGE
RX ENABLE
NOTES
1 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 10%
ALL CAPACITANCE VALUES ARE IN PICOFARADS
2 DIODES
SILICON
VARACTOR
PRINTING INSTRUCTIONS
DO NOT PRINT THIS FORM IN MANUAL
FIG NO 6-32B
PAGE NO 6-83
% of ORIG SIZE 48
SPECIAL INSTRUCTIONS
KING RADIO CORPORATION
KTR-905
SYNTHESIZER SCHEMATIC
002-0318-04



Note:

All diodes 1N4154

REV	C.O. NO	DATE	BY

REQ	PART NO	DESCRIPTION	ITEM

SCALE

KING RADIO CORPORATION — OLATHE KANSAS 66061

NAME System Status Alarm Board

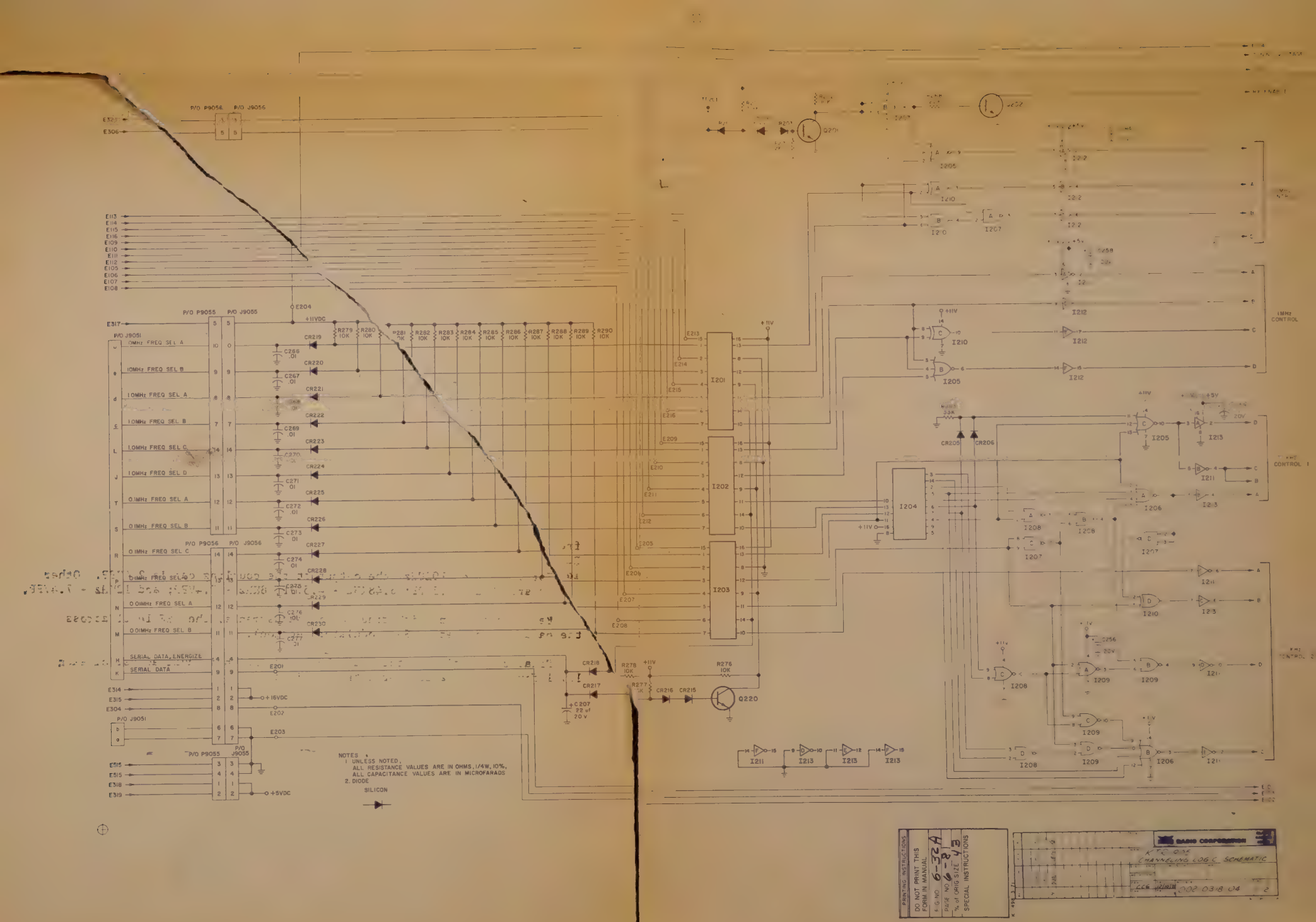
ELEC ENG | TOL UNLESS NOTED | MAT'L

MECH ENG

DRN CK | DATE 9-74 | NUMBER | SHT 1 OF

CHK | DATE

K-1221 1-67


P/O P9056
P/O J9056
P/O P9055
P/O J9055
P/O J9051
+11VDC
+16VDC
+5VDC
1MHz FREQ SEL A
10MHz FREQ SEL B
1.0MHz FREQ SEL A
1.0MHz FREQ SEL B
1.0MHz FREQ SEL C
1.0MHz FREQ SEL D
0.1MHz FREQ SEL A
0.1MHz FREQ SEL B
0.1MHz FREQ SEL C
0.01MHz FREQ SEL A
0.01MHz FREQ SEL B
SERIAL DATA, ENERGIZE
SERIAL DATA
NOTES
1 UNLESS NOTED,
ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 10%,
ALL CAPACITANCE VALUES ARE IN MICROFARADS
2. DIODE
SILICON
1MHz CONTROL
CONTROL 1
CONTROL 2
PRINTING INSTRUCTIONS
DO NOT PRINT THIS FORM IN MANUAL
F.G. NO. 6-32A
PAGE NO. 6-83
% of ORIG SIZE 43
SPECIAL INSTRUCTIONS
RADIO CORPORATION
KTC 035
CHANNELING LOGIC SCHEMATIC

AUDIO BOARD CALIBRATION

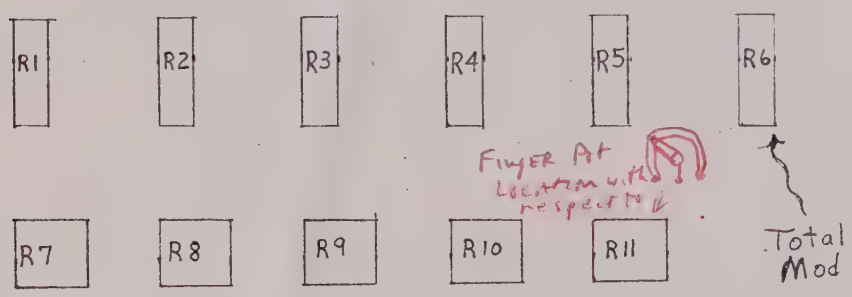
One edge of the audio board has 5 variable resistors and the other side 6. The side with 6 pots is the level adjust.

Connect a 465 or 475 scope to the coupling cap on the audio board (1.0mfd). Connect a frequency counter to the output of the scope on the channel you are using. Adjust all frequencies needed. Blue by Rec

Note: Adj Finger pot so 1020 can be set in before Adj all other Freq.

On the KX170B the frequencies are as follows: S1 = 4KHz; S2 = 1020Hz; S3 = 6.48KHz; S4 = 8KHz; and S5 = 12KHz.

The frequency and level adjust pots are as follows:



	Out Freq	Freq Adj	Level	Voltage P.P. O
S1	4K	R10	R1	4.5
S2	1020	R11	R2	2.4
S3	6.48	R7	R3	4.5
S4	8K	R8	R4	7.4
S5	12K	R9	R5	7.4

Adjust all frequencies and then set levels. Push in S5 for 12KHz frequency and adjust R5 fully CW. Adjust the total Mod Pot for 7.6VPP. Readjust R5 for 7.4 VPP output. Adjust other levels with the pots listed in the table above. <u>DO NOT READJUST TOTAL MOD</u>.

For a level of 1020Hz, the output at the coupling cap is 2.4VPP. Other levels are 4KHz - 4.5VPP; 6.48KHz - 4.5VPP; 8KHz - 7.4VPP; and 12KHz - 7.4VPP.

Before proceeding with final audio adjustments, the RF level across the band must be set. (See modulator section).

Final calibration of the audio board is the individual adjust of each level for the modulation percentage desired.

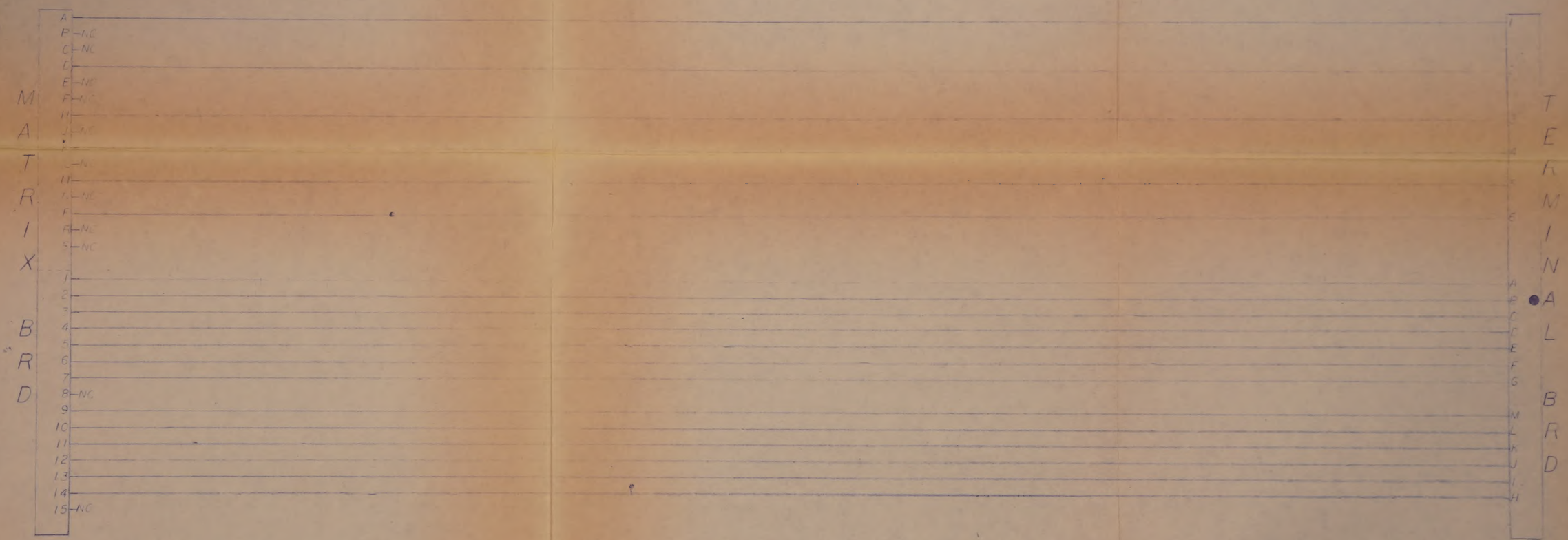
4K = 60% P ≅ 6.4 VPP U ≅ 1.6 VPP

1020 = 30% P ≅ 5.2 VPP U ≅ 2.8 VPP

6.48K = 60% P ≅ 6.4 VPP U ≅ 1.6 VPP

8K = 80% P ≅ 7.6 VPP U ≅ .8 VPP

12K = 80% P ≅ 7.6 VPP U ≅ .8 VPP



RED DOT NEXT TO PIN B

REV	C.O. NO	DATE	BY

REQ	PART NO	DESCRIPTION	ITEM

SCALE

KING RADIO CORPORATION OLATHE KANSAS 66061

NAME MATRIX TO TERMINAL BOARD INTER-CONNECT

ELEC ENG SR

MECH ENG SR

TOL UNLESS NOTED

MAT'L

DRN TK DATE

CHK TK DATE

NUMBER

SHT OF

K-1221 1-67